CA2 ALEN 18
86N57
Pt 1

North Saskatchewan River

Characterization of Water Quality in the Vicinity of Edmonton (1982-83)

Part I

Sessional Paper No. 532/86
1 Session, 21 Legislature

LEGISLATURE LIBRARY
SEP 16 1986

Alberta

ENVIRONMENT
Environmental Protection Services
Pollution Control Division
Water Quality Control Branch

NORTH SASKATCHEWAN RIVER:
CHARACTERIZATION OF WATER QUALITY
IN THE VICINITY OF EDMONTON (1982-1983)

PART I

INTRODUCTION, WATER CHEMISTRY, CHLOROPHYLL, BACTERIOLOGY

Prepared by: R.S. Anderson, Ph.D.
A.M. Anderson, Ph.D.
A.M. Akena, Ph.D.
J.S. Livingstone, B.Sc.
A. Masuda, B.Sc., P.Eng.
P.A. Mitchell, M.Sc.
T.B. Reynoldson, Ph.D.
D.O. Trew, B.Sc.
M. Vukadinovic, B.Sc., P.Eng.

Water Quality Control Branch
Pollution Control Division
Environmental Protection Services
Alberta Environment
Edmonton, Alberta

June 1986

EXECUTIVE SUMMARY

Beginning in the spring of 1982, a two-year study of the section of the North Saskatchewan River impacted by the greater Edmonton urban area was undertaken by the Water Quality Control Branch, Pollution Control Division, Alberta Environment. The principal purposes of the study were to characterize this section of the river chemically and biologically, to compare water quality in this section with the Alberta Surface Water Quality Objectives, and to assess major impacts of the greater Edmonton area on the river biota and water quality. Study locations were spaced strategically throughout the study section from a relatively unimpacted upstream location at Devon to a relatively well mixed location at Pakan, 160 km downstream. Left-bank, right-bank, and centre-channel sites were sampled at most locations.

Sampling included most standard chemical variables, metals, organics, pesticides, and one sediment sampling event. Complementary biological sampling (zoobenthos, algal chlorophyll-a, bacteria) was also done, because the biota tend to act as impact integrators over time and thereby reflect synergistic effects. This summary refers to both Part One and Part Two of the report.

Characterization

The total annual discharge of the North Saskatchewan River in 1982 was considerably above normal, although most of the additional volume was attributable to unusually high flows during late June and early July. Total annual discharge in 1983, on the other hand, was below normal, due mainly to very low flows in June and July.

Some variables tended to increase in a downstream direction due to natural causes, some were very much influenced by flow regime (i.e. dilution, seasonal, and flow-regulation effects), and others were affected by the mixing regime of the river. Several variables were influenced by inputs from the greater Edmonton urban area.

The chemical and physical variables affected by urban area inputs included temperature, dissolved oxygen, biochemical and chemical oxygen demand, non-filterable residues, specific conductance, total dissolved solids, the dissolved fraction of total organic carbon, total nitrogen, ammonia nitrogen, nitrate-plus-nitrite nitrogen, total phosphorus, sodium, potassium, chloride, sulfate, nickel, manganese, lead, and zinc. Loading estimates indicated that the main sources of increase for most of these variables in the Edmonton urban area were municipal wastewater treatment plants. For many organic substances, increases in values measured downstream of Edmonton were usually very low and no statistically significant pattern could be determined.

Some chemical variables were present either at levels below analytical detection limits or were affected very little by urban inputs. These variables included alkalinity, bicarbonate, fluoride, particulate phosphorus, and many metals (magnesium, calcium, mercury, cadmium, molybdenum, beryllium, copper, chromium, vanadium, arsenic, iron, aluminum).

Chlorophyll-a showed a marked summer increase in downstream direction for both planktonic and epilithic algae. Planktonic forms flow with the river, whereas epilithic forms are attached to rocks and remain until scoured away the following spring. All bacterial forms (total coliforms, fecal coliforms, fecal streptococci, and heterotrophic bacteria) increased greatly in number immediately below the Gold Bar Wastewater Treatment Plant and remained at high levels in the downstream part of the study section.

Due to inputs of organic matter and nutrients, sedimentation, and plant growth on the river bed substrates in and downstream of Edmonton, the zoobenthos changed from an assembly of clean-water taxa (dominated by certain species of stoneflies, mayflies, and caddisflies) at Devon to a less diverse and more abundant fauna characterized by pollution tolerant taxa (such as oligochaetes and chironomids) below Gold Bar. However, there was evidence of recovery in the zoobenthos further downstream. Zoobenthic data were useful in the interpretation of certain chemical data. The zoobenthic study also showed that temporal and spatial changes in the composition and numerical density of the zoobenthic community could be of great value in the scheduling of sampling and the selection of sites for future detailed water quality investigations.

Alberta Surface Water Quality Objectives

No objectives have been formulated for many of the variables assessed in this study, such as major ions, many specific trace organic compounds, total organic carbon, dissolved inorganic carbon, chemical oxygen demand, chlorophyll-a, and zoobenthos. The chemical variables in the preceding group are considered harmless at the concentrations measured in this study.

Many variables, namely temperature, dissolved oxygen, biochemical oxygen demand, most metals and certain organic compounds, complied with the Objectives or were below the analytical detection limits.

Some variables, namely total phenolic compounds, scattered or isolated occurrences of a few other organic compounds, ammonia -nitrogen, lead, and zinc, occasionally exceeded the Objectives. Natural levels of zinc at Devon frequently approached the Objective level for zinc.

A few variables frequently or regularly exceeded the Objectives: natural levels of iron and manganese exceeded the Objectives; 85% to 95% of samples for total phosphorus and 30% of samples for total nitrogen exceeded the Objectives at Pakan; 21% to 35% of all bacterial samples exceeded the Objectives at Pakan. Exceedence percentages for nutrients and bacteria were usually higher in close proximity to wastewater treatment plant outfalls.

Impacts

The greatest actual and potential impacts from the greater Edmonton urban area were associated with high nutrient loads, particularly phosphorus and nitrogen; direct effects were evident in increased plant growth (measured as chlorophyll-a), whereas secondary and synergistic effects contributed to some decrease in dissolved oxygen levels, some increase in biochemical oxygen demand values, and cyclic and compositional changes in the zoobenthic community. Smaller impacts were associated with particulate organic matter and total organic carbon loads; direct effects were linked to the abundance of zoobenthos and heterotrophic bacteria, whereas synergistic effects impacted dissolved oxygen, chemical and biochemical oxygen demand.

Another important impact was associated with high bacterial numbers, which affect some potential uses for the river water.

This study did not address the short-lived taste and odor problems that usually occur at the time of spring runoff. However, the concentrations of the substances suspected of causing these organoleptic problems were usually very low.

TABLE OF CONTENTS

		Page
	EXECUTIVE SUMMARY	i
	TABLE OF CONTENTS	vi
	LIST OF TABLES	viii
	LIST OF FIGURES	xi
	LIST OF ABBREVIATIONS	xv
	ACKNOWLEDGMENTS	xvii
1.0	INTRODUCTION	1
2.0	BASIN CHARACTERISTICS	9
2.1	Location	9
2.2	Climate	9
2.3	Geology, Geological History	11
2.4	Hydrology	13
2.5	Groundwater	15
2.6	Geomorphology, Channel Characteristics	17
2.7	Soils	19
2.8	Land Use	20
2.9	Water Use	21
2.10	Potential Sources of Pollution to the River	25
3.0	MIXING PROCESS IN THE NORTH SASKATCHEWAN RIVER	32
4.0	THE STUDY AREA AND STUDY DESIGN	35
5.0	GENERAL METHODS	49
5.1	Field Methods	49
5.2	Laboratory Methods	52
5.3	Statistical Methods	56
5.4	Interpretation	57
6.0	TEMPERATURE	58
6.1	Results and Discussion	58
6.2	Surface Water Quality Objectives	63
6.3	Impacts	63
7.0	DISSOLVED OXYGEN	65
7.1	Results and Discussion	65
7.2	Surface Water Quality Objectives	71
7.3	Impacts	71
8.0	MAJOR IONS AND RELATED VARIABLES	75
8.1	Results and Discussion	75
8.1.1	Chloride	82
8.1.2	Sodium	89
8.1.3	Potassium	95
8.1.4	Storm Sewers and Snow Dumps	99
8.2	Surface Water Quality Objectives	101
8.3	Impacts	102

9.0 METALS 103
9.1 Results and Discussion 103
9.2 Surface Water Quality Objectives 116
9.3 Impacts 125
9.4 Sediments 126

10.0 ORGANIC COMPOUNDS 128
10.1 Results and Discussion 130
10.2 Surface Water Quality Objectives 142
10.3 Impacts 143

11.0 NUTRIENTS: PHOSPHORUS AND NITROGEN 146
11.1 Results and Discussion: Total Phosphorus 148
11.2 Surface Water Quality Objectives: Phosphorus 156
11.3 Impacts: Phosphorus 158
11.4 Results and Discussion: Nitrogen 159
11.5 Surface Water Quality Objectives: Nitrogen 165
11.6 Impacts: Nitrogen 167

12.0 CHLOROPHYLL-a 169
12.1 Potamo-phytoplankton: Results 170
12.2 Epilithic Algae: Results 172
12.3 Discussion: River Chlorophyll-a 177
12.4 Surface Water Quality Objectives 180
12.5 Impacts 182

13.0 CARBON 184
13.1 Results and Discussion: Inorganic Carbon 185
13.2 Results and Discussion: Organic Carbon 185
13.3 Surface Water Quality Objectives 190
13.4 Impacts 191

14.0 BACTERIA 192
14.1 Results and Discussion: Seasonal Trends 195
14.2 Results and Discussion: Spatial Trends 201
14.3 Surface Water Quality Objectives 210
14.4 Impacts 213

15.0 BOD/COD 217
15.1 Results and Discussion: BOD 218
15.2 Surface Water Quality Objectives: BOD 223
15.3 Results and Discussion: COD 224
15.4 Surface Water Quality Objectives: COD 227
15.5 Impacts: BOD and COD 227

16.0 SUMMARY 229

17.0 PERSONAL COMMUNICATIONS 246

18.0 REFERENCES 247

LIST OF TABLES

Page

2.1 Mean monthly discharges, NSR at Edmonton. 14

2.2 Summary of bed material size, NSR. 18

2.3 Summary of water withdrawals and consumption, NSR, Devon to Fort Saskatchewan, 1981. 22

4.1 Main industrial effluents entering the NSR in the Edmonton area. 36

4.2 Municipal effluents entering the NSR, directly or indirectly, in the Edmonton area. 39

4.3 Regular river sampling locations NSR, 1982 and 1983 . 40

4.4 Variables for which analyses were performed, NSR, 1982 fixed season. 42

4.5 Variables for which analyses were performed, NSR, 1983 fixed season. 43

4.6 Summary of sampling events and variables assessed, tributaries and effluents. 46

5.1 Summary of analytical methods (NAQUADAT codes), AEC 1982-1983. 53

5.2 Summary of analytical methods (NAQUADAT codes) for organics and for analyses other than by AEC, 1982-1983. 54

6.1 Temperature summary for the North Saskatchewan River, Devon and Pakan sampling locations, NSR, 1982-1983. . 61

6.2 Temperature summary (°C) for the North Saskatchewan River, Beverly Bridge (centre-channel site) and Clover Bar (right-bank site) locations, 1982. 62

7.1 Dissolved oxygen as percent saturation for the NSR from May, 1982 to February, 1984. 68

7.2 Dissolved oxygen criteria for assessment of harm in various fish groups. 72

8.1 Median concentrations, major ions and related variables, NSR. 76

8.2 Estimated industrial daily loadings to NSR. 80

8.3 Estimated municipal daily loadings to NSR. 81

8.4 Estimated daily loading of sodium, chloride, and potassium from NSR tributaries. 83

8.5 NSR chloride concentrations, July 27, 1982, at high flow. 90

8.6 NSR chloride concentrations, Aug. 24, 1982, at low flow. 91

9.1 Summary of metal responses in the water phase, NSR, 1982-1983. 104

9.2 Metals below the detection limit in the water phase, NSR, 1982-1983. 104

9.3 Metals showing little or no change in the water phase, NSR,1982-1983. 106

9.4 Manganese in the water phase, NSR, 1982-1983. 111

9.5 Zinc in the water phase, NSR, 1982-1983. 118

9.6 Zinc concentrations compared to Alberta Surface Water Quality Objectives. 122

9.7 Lead concentrations compared to Alberta Surface Water Quality Objectives. 124

9.8 Metals in NSR sediments, 5-6 October, 1983. 127

10.1 Phenolic concentrations and loadings from tributaries, NSR, 1983. 133

10.2 Occurrence of phenolics at concentrations > 0.005 $mg \cdot L^{-1}$ NSR, 1983. 134

10.3 Phenolic concentrations and loadings from municipal discharges, NSR, 1983. 136

10.4 Concentrations of organic constituents, NSR sediments, 1983. 141

11.1 Estimated total phosphorus and total nitrogen loads from major tributaries, NSR, 1983. 155

14.1 Total and fecal coliforms and fecal streptococci, Devon and Pakan, 1978-1983. 214

LIST OF FIGURES

Page

1.1 Map of Saskatchewan River - Nelson River drainage basin 3

2.1 Map of NSR drainage basin 10

2.2 Map of NSR drainage basin showing relative population centre sizes 26

2.3 Relative flows from point sources, NSR, 1982-1983 28

2.4 Map showing major snow dumps operated by the City of Edmonton 31

4.1 Map of the study section of the NSR 37

6.1 Water temperatures at 11 locations, NSR, 1982 60

7.1 Median dissolved oxygen and water temperatures, NSR, 1982-1984 66

7.2 Dissolved oxygen as percent saturation, NSR, selected dates 1982-1984 70

8.1 Median NSR chloride concentrations with estimated point-source loadings, 1983. 84

8.2 NSR chloride concentrations, August 3-4, 1983, and actual point-source loadings. 87

8.3 Median NSR sodium concentrations with estimated point-source loadings 1983. 92

8.4 NSR sodium concentrations, Aug. 3-4, 1983, and actual point-source loadings. 94

8.5 Median NSR potassium concentrations and estimated point-source loadings, 1983. 96

8.6 NSR potassium concentrations, Aug. 3-4, 1983, and actual point-source loadings. 98

9.1 Extractable iron at two NSR study locations, 1982-1983 107

9.2 Extractable aluminum at the Beverly Bridge location, NSR, 1982-1983 108

9.3 Total manganese at Pakan Bridge, NSR, 1982-1983 110

9.4 Median manganese concentrations and estimated point-source loadings, NSR, 1982-1983. 112

9.5 Median concentrations of nickel and lead, NSR, 1982-1984 113

9.6 Median nickel concentrations and estimated point-source loadings, NSR, 1982-1983. 114

9.7 Median lead concentrations and estimated point-source loadings, NSR, 1982-1983. 116

9.8 Median zinc concentrations and estimated point-source loadings, NSR, 1982-1983. 119

10.1 Variations in phenolic concentrations at 3 NSR locations, 1982-1983 132

10.2 Longitudinal variation in phenolic concentrations for 4 dates, NSR, 1982 138

10.3 Longitudinal variation in phenolic concentrations for 4 dates, NSR, 1983 139

11.1 Median total phosphorus values, NSR, 1982-1983 149
11.2 Total phosphorus, NSR, 1982-1983 151
11.3 Median total phosphorus and estimated point-source loadings, NSR, 1983-1984. 153
11.4 River reaches in which TN and TP exceeded ASWQO 157
11.5 Total Kjeldahl nitrogen, NSR, 1983-1984 160
11.6 Ammonia-nitrogen, NSR, 1983-1984 161
11.7 Nitrate-plus-nitrite nitrogen, NSR, 1983-1984 162
11.8 Median total nitrogen and estimated point-source loadings, NSR, 1983-1984. 164
12.1 Longitudinal trends, potamo-phytoplankton chlorophyll-a, NSR, 1983 171
12.2 Seasonal patterns, potamo-phytoplankton chlorophyll-a, NSR, 1983 173
12.3 Longitudinal trends, epilithic chlorophyll-a, NSR, 1983 174
12.4 Seasonal patterns, epilithic chlorophyll-a, NSR, 1983 176
13.1 DOC + TPC at Devon, Beverly Bridge, and Pakan, and NSR discharge at Edmonton, 1983 186
13.2 Median dissolved organic carbon, NSR, 1983 188
13.3 Median TPC in the NSR, 1983 189
14.1 Total coliforms at Devon, Beverly Bridge, and Pakan, 1982-1983 196
14.2 Fecal coliforms at Devon, Beverly Bridge, and Pakan, 1982-1983 197

14.3 Fecal streptococci at Devon, Beverly Bridge, and Pakan, 1982-1983 198

14.4 Total coliforms in the NSR. Median values 1982-1983 202

14.5 Fecal coliforms in the NSR. Median values 1982-1983 203

14.6 Fecal streptococci in the NSR. Median values 1982-1983 204

14.7 Heterotrophic bacteria in the NSR. Median values 1982-1983 205

14.8 Concentrations of total and fecal coliforms, NSR, 1982-1983 212

15.1 Spatial biochemical oxygen demand, NSR, 1982-1983 .. 219

15.2 Seasonal biochemical oxygen demand, NSR, 1982-1983 220

15.3 Median BOD levels and estimated continuous point-source loadings, NSR, 1982-1983. 222

15.4 Spatial chemical oxygen demand, NSR, 1982-1983 225

15.5 Median COD levels and estimated continuous point-source loadings, NSR, 1982-1983. 226

LIST OF ABBREVIATIONS

AEC	Alberta Environmental Centre, Vegreville, Alberta
ASWQO	Alberta Surface Water Quality Objectives
BOD	biochemical oxygen demand
COD	chemical oxygen demand
chl-a	chlorophyll-a
C.L.I.	Canada Land Inventory
$cm \cdot y^{-1}$	centimetres per year
km	kilometre
$km \cdot h^{-1}$	kilometres per hour
$kg \cdot d^{-1}$	kilograms per day
L	litre
$L \cdot s^{-1}$	litres per second
m	metre
mL	millilitre
$mg \cdot L^{-1}$	milligrams per litre
µm	micrometre (= mm X 10^{-3})
$\mu g \cdot L^{-1}$	micrograms per litre
$\mu S \cdot cm^{-1}$	micro-Siemens per centimetre (a measure of conductance)
mm	millimetre
$m^3 \cdot s^{-1}$	cubic metres per second
nm	nanometre (= 10^{-9} metre); 1 nm = 10 Angstrom units

TOC	total organic carbon
DOC	dissolved organic carbon
DIC	dissolved inorganic carbon
TPC	total particulate carbon
TC	total coliform bacteria
FC	fecal coliform bacteria
FS	fecal streptococci
MF	membrane filtration technique
MPN	most probable number
EPA	Environmental Protection Agency (United States)
GBWTP	Gold Bar Wastewater Treatment Plant (City of Edmonton)
NSR	North Saskatchewan River
OECD	Organization for Economic Co-operation and Development
n	number (no. of cases used in calculating probability)
P	probability (statistical)
ND	not detectable
NFR	non-filterable residue
TN	total nitrogen
TKN	total Kjeldahl nitrogen
NH_3-N	ammonia nitrogen
NO_2-N	nitrite nitrogen
NO_2+NO_3-N	nitrite plus nitrate nitrogen
PCBs	polychlorinated biphenyls
TDS	total dissolved solids
TP	total phosphorus

ACKNOWLEDGMENTS

The authors are grateful for the help and services provided by other individuals within Alberta Environment. From the Water Quality Control Branch, Grant Bodie, David Dowhaniuk, George Scammell, and Martin Soetaert assisted with sampling and logistics; Ron Tchir provided computing assistance; Robin Edwards, Marianne Klemka, and Teresa Richey assisted with proofing and related draft preparation. Val Moraglia, Planning Division, provided background reports and maps. Figures for Parts One and Two of this report were prepared by Terry Zenith and staff, Design and Construction Division. Critical reviews of some sections of the report were provided by Joe Milos and Laury North, Municipal Engineering Branch. We especially thank Lilliane Godin for typing the manuscript and tables.

Chemical analyses were conducted at the Alberta Environmental Centre (Vegreville), the Gold Bar Wastewater Laboratory and the Rossdale Water Treatment Laboratory of the Water and Sanitation Department, City of Edmonton, the Environmental Protection Service microbiology laboratory of Environment Canada, Western and Northern Region (Edmonton), and the National Water Research Institute (Burlington).

1.0 INTRODUCTION

The North Saskatchewan River (NSR) is a major tributary of the Saskatchewan-Nelson river system, which drains a large part of three Canadian provinces (Alberta, Saskatchewan, and Manitoba), as well as the State of North Dakota. From its source, the Saskatchewan Glacier on the Alberta-British Columbia border, the NSR flows eastward across central Alberta and into Saskatchewan where it joins the South Saskatchewan River east of Prince Albert to form the Saskatchewan River. The Saskatchewan River flows into Cedar Lake and then Lake Winnipeg in Manitoba, eventually draining into the Hudson Bay through the Nelson River (Fig. 1.1).

Historically, the NSR was an important transportation and communication route, and several early settlements were established along its banks. Many of these settlements have grown into regional population centres (among which Edmonton is the largest) which are dependent on the river, both as a source of water for domestic, agricultural, and industrial purposes, and as a receiving water for various domestic and industrial waste-water effluents. During the past half century, there have been large increases in human population and in agricultural and industrial activities in the NSR drainage basin. With the growth in population, the river and its valley have also become the focus of many recreational activities and aesthetic interests. More recently, dams and diversions have resulted in alterations in river flow.

The cultural activities of a growing human population, unnatural changes in flow regimes, and variations in climatic conditions have combined to produce fluctuations in both the quantity and quality of water in the NSR. Changes in economic and social conditions have contributed to conflicts of interest concerning river use and differences in the conception of water quality in the river.

In 1981, a contemporary study of the NSR was planned by the Water Quality Control Branch of Alberta Environment. This was done because of an apparent public conception that the NSR water quality was bad and getting worse, and because of a Departmental need for updated and upgraded water quality data and the re-evaluation of impacts due to the concentration of population and industry in and near the City of Edmonton. No one year is likely to be typical, so the plan was for at least a two-year study. Because the region including Edmonton City and immediate vicinity is the main user and impacter of the NSR, the study focussed on a section of the river extending from an essentially unimpacted site upstream of Edmonton to a site well inside an hypothesized recovery zone, where mixing was believed to be complete. Sampling was carried out during the ice-free periods of 1982 and 1983, and on two winter dates in 1984.

The principal objectives of this study were:

1. to provide a spatial and temporal characterization of the NSR water quality in the vicinity of Edmonton by assessing bank-to-bank, upstream-downstream, and seasonal differences.
2. to compare present NSR water quality to the Alberta Surface Water Quality Objectives (ASWQO, Alberta Environment 1977) or to other

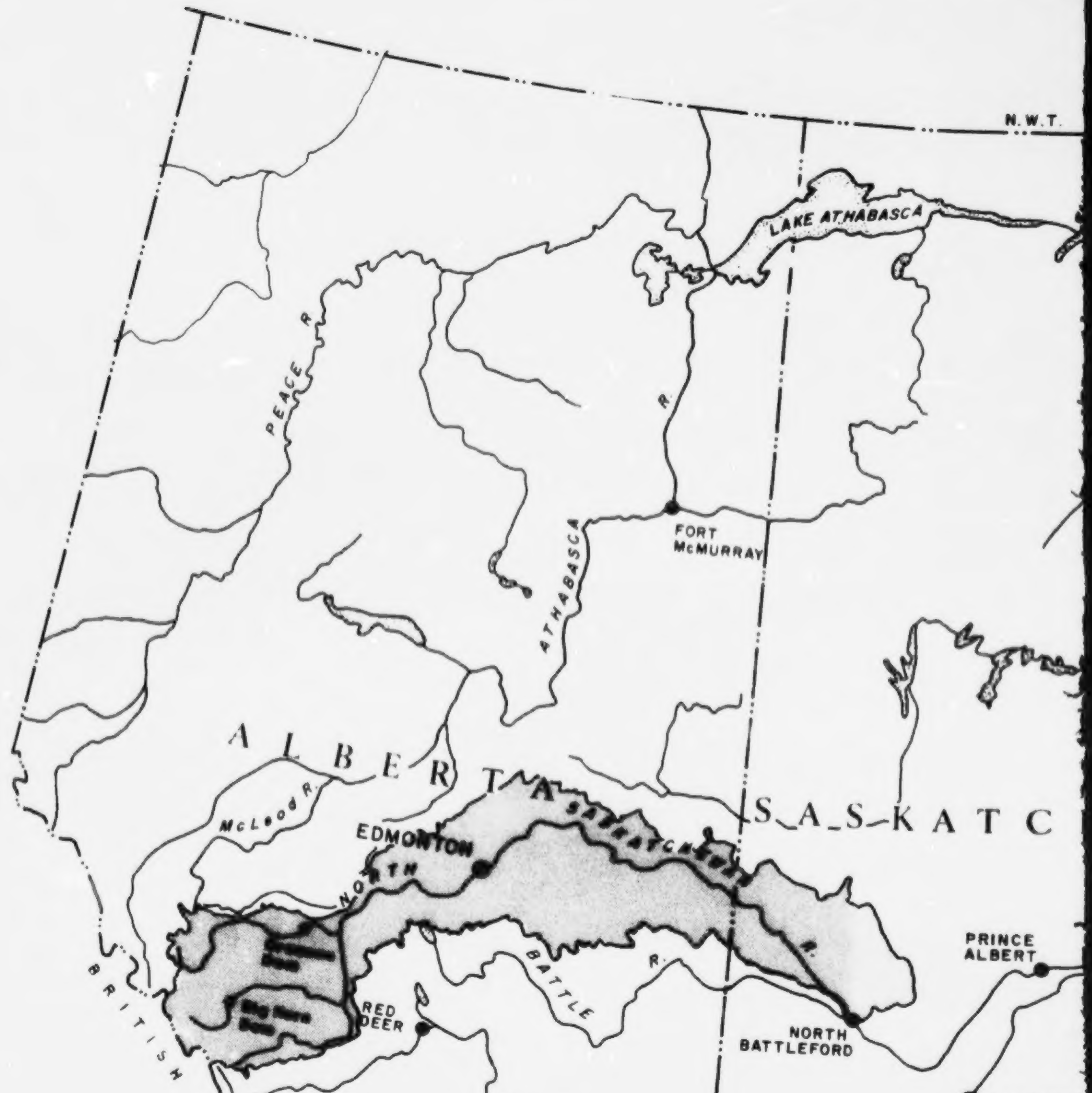
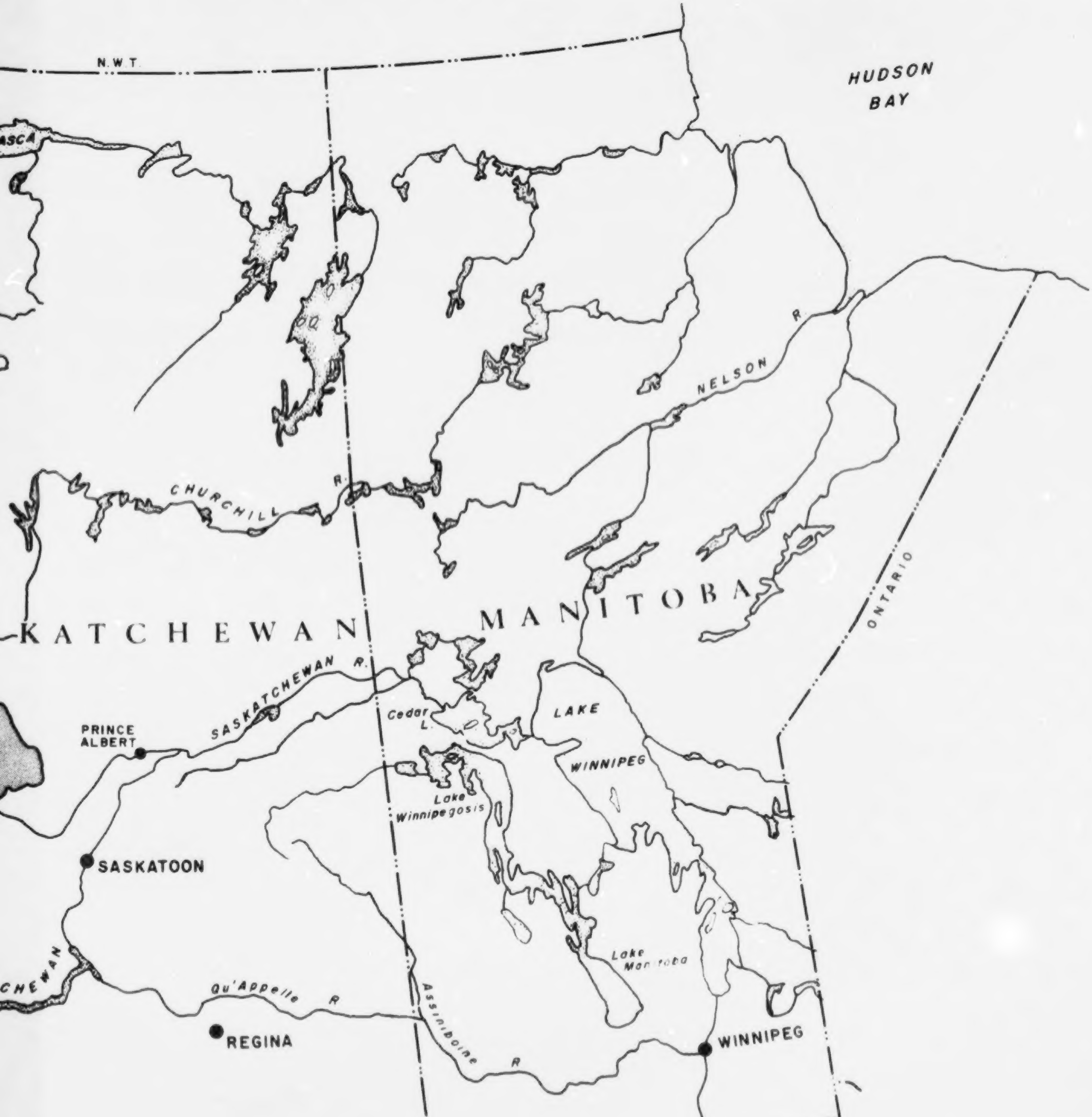

N.W.T.
LAKE ATHABASCA
PEACE R.
ATHABASCA R.
FORT McMURRAY
ALBERTA
McLeod R.
EDMONTON
NORTH SASKATCHEWAN R.
SASKATC
BATTLE R.
PRINCE ALBERT
NORTH BATTLEFORD
RED DEER
SASKATO
RED DEER R.
BRITISH COLUMBIA
CALGARY
BOW R.
SOUTH SASKATCHEWAN
SCALE
0 50 100 150 200 250 km
LETHBRIDGE
CANADA
U.S.A.

Fig. 1.1 SASKATCHEWAN - NELSON BASIN SHOWING THE NORTH SASKATCHEWAN RIVER


N.W.T.
HUDSON BAY
ASCA
NELSON R.
CHURCHILL R.
KATCHEWAN
MANITOBA
ONTARIO
SASKATCHEWAN R.
PRINCE ALBERT
Cedar L.
LAKE WINNIPEG
Lake Winnipegosis
SASKATOON
CHEWAN
Qu'Appelle R
Assiniboine R
REGINA
Lake Manitoba
WINNIPEG

RIVER

criteria, if no specific Alberta objectives had been formulated.

3. to assess impacts of major developments in the Edmonton region on the NSR, and to provide a general evaluation of point sources which affect the general water quality or "well being" of the river.

Some comments and explanations concerning these three objectives follow.

Characterization: The first objective of this study was to relate river basin and flow characteristics, developments, and related aspects to general water quality. The results were expected to reflect the fact that growth and development have occurred, producing changes in water quality, and that growth and resultant changes to water quality will continue to occur. In a continuously changing environment, there is an ongoing need for new baseline data and for updating or upgrading the existing data base. Additions or changes in emphasis were made during the course of this study to fill data gaps, to assess newly perceived or suspected point-source inputs, to aid in comparisons with previous studies, and to reflect planning requirements. It was not the purpose of this study to provide day-to-day monitoring of selected variables which are suspected of exceeding limits or guidelines for a few hours or a few days under extreme conditions, such as those which occur during spring run-off or storm events. Findings are presented in "Results and Discussion" subsections of each major section dealing with a particular variable or group of variables.

Surface Water Quality Objectives: In 1977, provincial water quality guidelines and objectives were published for Alberta (ASWQO, Alberta Environment 1977) to provide protection for the most sensitive uses for which the resource is required (propagation of aquatic life, public water supply, and direct contact recreation). The numerical values established for the water quality variables represent goals which should be achieved or surpassed. It should be noted that the ASWQO were not designed for particular watersheds, but were intended to apply throughout the province. Consequently, they cannot account for the extremes in natural concentrations which can be expected to occur over such a large geographical area. Therefore, natural concentrations of certain substances may exceed the objectives in some watersheds (pristine or developed), depending on their unique geochemical characteristics.

Certain variables have not yet been included in the ASWQO or, for that matter, in any available set of objectives. In these cases, available objectives or appropriate published guidelines or criteria have been consulted in assessing the importance of the concentrations or values encountered.

Impacts: When certain variables approached or exceeded the ASWQO, their actual or potential impacts were considered from an appropriate point of view, such as the impairment of water quality, the impediment to legitimate use of the river, the effect on other variables under assessment, or the effect on the biotic community.

For purposes of organizing schedules and sampling, the river was considered to have three components: the flowing water and its non-living dissolved and suspended load; the stationary sedimentary material comprising the river bed; the biota or biological life in the water and within or upon the underlying sediments. To the majority of people, the most obvious aspect of a large river such as the NSR is the flowing water, especially its appearance, its taste, or odor, and the "invisible" dissolved substances which it carries. Consequently, the physical and chemical variables of the water component were monitored most frequently and intensively. Calculations of the loading contributions from major tributaries and effluents were done to aid in identifying point-source impacts. Two biological variables, the bacteria and the river- (or potamo-) phytoplankton, were usually sampled on the same schedule as the water component. Because of the water's short residence time within the study section of the NSR, it was believed that cumulative effects might be reflected better by non-flowing components. Therefore, the study included a fairly intensive survey of the invertebrate animals on and in the bottom sediments and a preliminary examination of the epilithic algae (i.e. the algae attached to the surface of rocks). A macrophyte survey was not included in the present study; had macrophyte development been widespread or consistent in the NSR prior to the conception of this study, a survey of distribution and abundance would have been included for the same reasons that surveys of zoobenthos and epilithic algae were included. The fish community in the river was not included in this study. Because of the absence of data on the chemistry of the riverbed sediments, a preliminary survey was undertaken in the hope that it would aid in interpretation and that it would clarify the need for a more detailed investigation.

In overview, this report consists of three parts. Part One begins with a summary of river basin characteristics and a review of existing information on NSR mixing properties. This is followed by a summary of sampling dates and locations, measured variables, field methods, and laboratory methods. The results sections of Part One include temperature, dissolved oxygen, results of analyses for major ions, metals, organic compounds, macronutrients, chlorophyll-a surveys, carbon, bacteria, and BOD/COD. Results from sediment analyses are included in the metals and organic compounds sections.

Part Two of this report is an analysis of the zoobenthos (i.e. those insect larvae, worms, and other invertebrates inhabiting the bottom sediments under the flowing water) and an interpretation of its value as an integrator in determining year-round water quality fluctuations.

Part Three is a compendium of analytical data from Part One and Part Two of this study. Because all graphs, tables, and discussion in Part One have been drawn from or based on this data base and because no additional data are included in Part Three, it is not intended for general distribution, but will be available upon special request.

2.0 RIVER BASIN CHARACTERISTICS

2.1 Location

The North Saskatchewan River (NSR) originates in the Rocky Mountains and flows eastward through Alberta to be joined by the South Saskatchewan River in Saskatchewan. The City of Edmonton is located along the river midway between its origin in the mountains and its points of crossing the Alberta-Saskatchewan border. The study section of the river extended from Devon (113° 45'W, 53° 22'N) to Pakan (112° 29'W, 53° 59'N), or approximately 40 km upstream and 123 km downstream of Edmonton City centre, respectively. General location and NSR drainage basin details are shown in Figure 2.1.

2.2 Climate

The climate of the region is continental, producing warm summers and cold winters. The monthly mean temperature ranges from -17°C in January to +17.2°C in July. The winter season (mean daily temperature 0°C or less) usually begins the first week in November and ends in early April. Winter temperatures have a greater range than summer temperatures, with January usually being the coldest month. Frost-free days average 100; summer temperatures seldom exceed 32°C and have never exceeded 38° C. The mean annual temperature in Edmonton for the period 1931-1971 was 2.7°C.

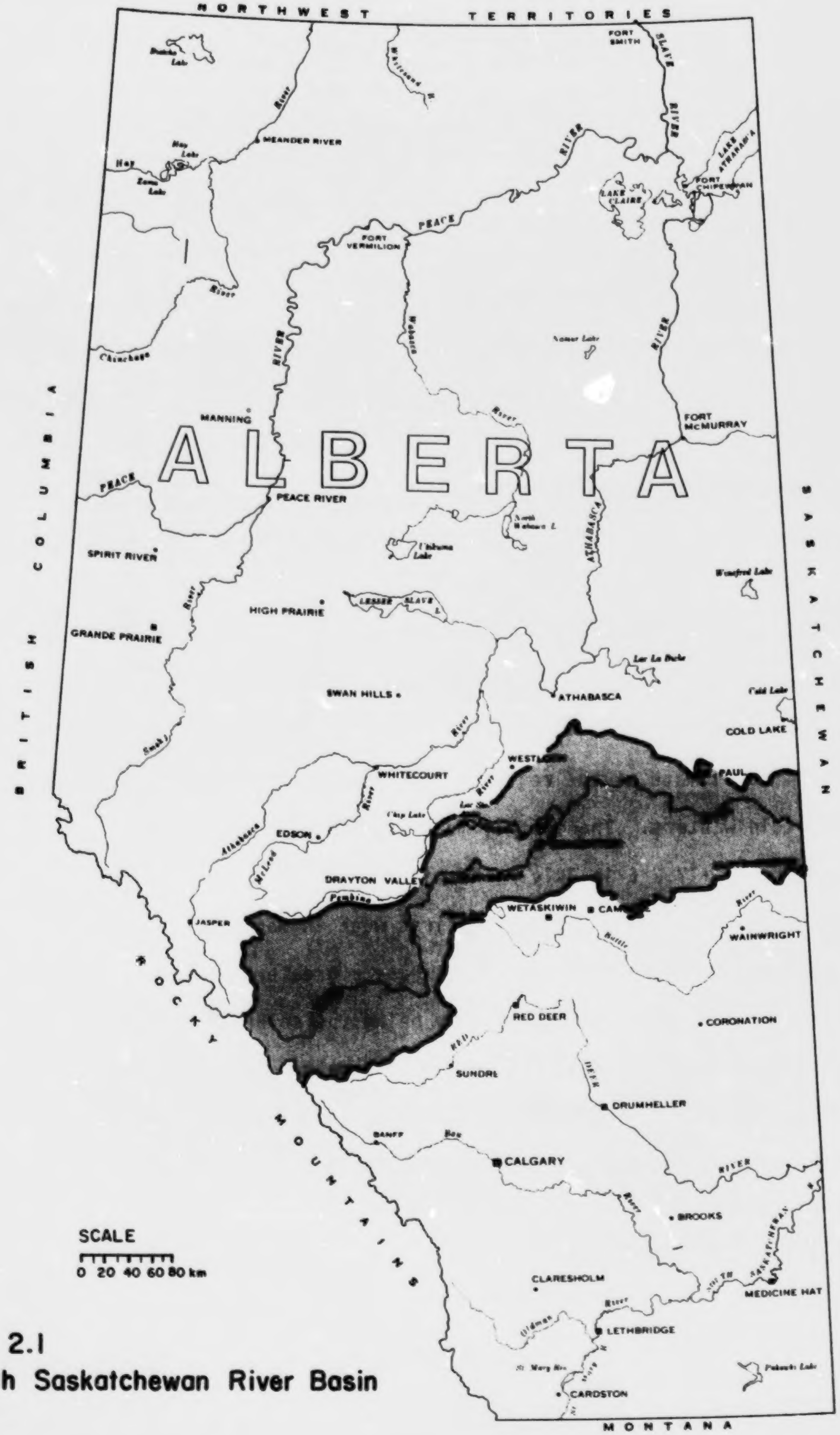

NORTHWEST TERRITORIES
FORT SMITH
SLAVE RIVER
LAKE ATHABASCA
FORT CHIPEWYAN
LAKE CLAIRE
MEANDER RIVER
Hay Lake
Zama Lake
Hay
PEACE RIVER
FORT VERMILION
Chinchaga
MANNING
ALBERTA
FORT McMURRAY
PEACE
PEACE RIVER
SPIRIT RIVER
GRANDE PRAIRIE
HIGH PRAIRIE
LESSER SLAVE L.
Utikuma Lake
North Wabasca L.
ATHABASCA
Winefred Lake
Lac La Biche
ATHABASCA
Cold Lake
COLD LAKE
SWAN HILLS
Smoky
WHITECOURT
WESTLO
PAUL
Chip Lake
EDSON
Athabasca
McLeod
DRAYTON VALLEY
Pembina
JASPER
WETASKIWIN
CAM
Battle
WAINWRIGHT
RED DEER
CORONATION
SUNDRE
DEER
DRUMHELLER
BANFF
Bow
CALGARY
RIVER
Bow River
BROOKS
SASKATCHEWAN
CLARESHOLM
SOUTH
MEDICINE HAT
Oldman River
LETHBRIDGE
St. Mary Res.
Pakowki Lake
CARDSTON
MONTANA
BRITISH COLUMBIA
SASKATCHEWAN
ROCKY MOUNTAINS
SCALE
0 20 40 60 80 km

Fig. 2.1
North Saskatchewan River Basin

The Edmonton area has the lowest average wind speed (15 km•h^{-1}) of cities on the Canadian Prairie. The wind blows most frequently from the Northwest (NW quadrant) and South (SE to SW). Highest mean wind speeds are from the Northwest (NW quadrant) and Southeast (SE quadrant) (Environment Canada 1982).

Precipitation ranges between 30 and 64 cm, averaging 47 cm •y^{-1} (Kathol and McPherson 1975).

2.3 Geology, Geological History

The bedrock directly underlying the North Saskatchewan River within the study area is of late Cretaceous age. It dips westward so that successively younger strata outcrop in a southwesterly direction up to the base of the Rocky Mountains. The Wapiti formation, which lies north of the river throughout the study area, is a combination of the Horseshoe Canyon formation and Belly River formation. To the south of the river, these latter formations are more clearly defined because the marine Bearspaw formation is often present between them. The river has been arbitrarily designated the boundary between the Wapiti formation and the Horseshoe Canyon and Belly River formations (Ceroici 1979).

The Horseshoe Canyon formation consists of fine-grained bentonitic sandstones, silty shales, lenticular coal lenses and beds of bentonite (Ceroici 1979). The Belly River formation is similar, consisting of grey to greenish grey, thick-bedded feldspathic sandstone, grey clayey siltstone, grey and green mudstone, and ironstone concretions (Stein 1976).

Bedrock is exposed along the length of the river, especially upstream of Clover Bar in the City of Edmonton. There has been less erosion downstream of Clover Bar because the river follows the pre-glacial Beverly Channel. Bedrock erosion is also visible along the major tributary creeks (Kathol and McPherson 1975). Saskatchewan sands and gravels deposited as channel-fill in pre-glacial valleys also outcrop along the river (Bayrock and Hughes 1962).

As the Keewatin Glacier retreated about 10,000 years ago, proglacial Lake Edmonton formed against the dam of the retreating glacier. The lake covered the area now occupied by the City of Edmonton, extended beyond Devon to the west, and drained to the south via what is now termed Blackmud Creek, through Saunders and Coal lake channels to the Battle River.

After Lake Edmonton drained, the North Saskatchewan River was formed as one channel of a braided stream flowing over the lake bed. Remnants of the braided area can be seen on present day air photos between Spruce Grove and Devon; downstream of the Edmonton city, the river consisted of a single channel (Bayrock and Hughes 1962).

Most of the area between Devon and Pakan is overlain by glacial till. The till is a poorly sorted mixture of clay, silt, sand and gravel consisting of 80% local bedrock and 20% Canadian Shield igneous and metamorphic rocks. Montmorillonite is the dominant clay mineral.

The railway bridge west of Clover Bar and within Edmonton City marks the boundary of two river reaches. Upstream of this point, the valley is 1 km wide or less, bordered by 60 m cliffs. Downstream of

Clover Bar, the river follows the pre-glacial Beverly channel; the present valley is 2 km wide or wider, bordered by cliffs of less than 40 m (Bayrock and Hughes 1962, Nwachukwu and Neill 1972). Glacial till averages 15 m thick in the Beverly Valley.

2.4 Hydrology

The watershed of the North Saskatchewan River at Edmonton comprises 27,195 km^2. The Edmonton gauge station at the Low Level Bridge (Water Survey of Canada 05DF001) has a zero elevation of 609.7 m (Kellerhals _et_ _al_. 1972).

Flow on the North Saskatchewan is regulated by two hydroelectric power dams. The Brazeau Dam, on the main tributary to the North Saskatchewan, began power generation in 1965; the Bighorn Dam on the mainstem was completed in 1972 (Fig. 1.1). These dams lower the flood peaks, shorten the duration of flushing flows by one-half, and augment winter flows (Crosby 1982). The percentage of peak flow reduction decreases downstream as the amount of unregulated watershed increases. Winter flow augmentation also decreases in a downstream direction, although winter flows are two to three times greater at Edmonton than the pre-regulation flows would have been (Doyle and Thompson 1979).

The average annual discharge of the North Saskatchewan River at Edmonton since 1973 is 196 $m^3 \cdot s^{-1}$. The highest mean monthly flow is in June (351 $m^3 \cdot s^{-1}$) and the lowest mean monthly flow is in December (111 $m^3 \cdot s^{-1}$). Mean monthly flows for 1982-1983 are presented in Table 2.1.

TABLE 2.1 Mean monthly discharges ($m^3 \cdot s^{-1}$)* for 1982 and 1983 and historical mean monthly discharges (1973-1983) for the North Saskatchewan River at Edmonton

	1982	1983	Historical
January	103	141	114
February	128	115	119
March	128	126	125
April	240	280	227
May	216	259	280
June	282	240	351
July	742	299	348
August	169	143	212
September	177	119	186
October	182	118	151
November	104	130	125
December	129	107	111
mean	218	173	196

* Water Survey of Canada data (Environment Canada 1983, 1984a, 1985).

The total discharge during 1982 was much greater than the historical mean, but most of this was due to flows greater than twice the long-term mean in July as a result of unusually heavy rainfall throughout the area. Flows during the other months of 1982 were near or sometimes below the mean. Total discharge during 1983 was slightly below the historical mean. Flows in 1983 were below average for all months from May to October, inclusive, and especially low for June and July.

The two reservoirs provide flood protection in the spring-early summer period, but downstream areas could flood during late summer storms. Doyle and Thompson (1979) estimate that the volume of the once in 100-year flood at Edmonton would be smaller by 10% as a result of the dams.

2.5 Groundwater

Southwest of the city the Horseshoe Canyon formation produces poor groundwater yields (0.1 - 0.46 $L{\cdot}s^{-1}$) except in the Millet area. The major pre-glacial tributary of the Beverly Channel, the Stony Valley, contains Saskatchewan sands and gravels which have a high groundwater yield rate (2 - 7.6 $L{\cdot}s^{-1}$). The pre-glacial sands are recharged where the valley is crossed by the North Saskatchewan River on the southwestern edge of the City of Edmonton. The direction of groundwater flow in this area is toward the Stony Valley and the North Saskatchewan River, and then toward the northeast. The river is a major groundwater discharge area; most of the springs along the river bank arise at the drift-bedrock contact (Ceroici 1979).

Calcium-magnesium bicarbonate water predominates in the surficial deposits, whereas bedrock aquifers tend to yield sodium-bicarbonate water. Upstream of the city, bedrock aquifers may yield considerably greater quantities of groundwater than surficial deposits. Chloride concentrations are generally less than 50 $mg \cdot L^{-1}$ in surficial deposits and bedrock. Sulfate concentrations in bedrock groundwater average 100 $mg \cdot L^{-1}$, but are more variable in drift groundwater. Iron is low in bedrock waters, but surficial deposit waters may contain concentrations of over 5 $mg \cdot L^{-1}$. The highest iron concentrations are in water from dune fields and Saskatchewan sands and gravels. In general, total dissolved solids concentrations are usually less than 2500 $mg \cdot L^{-1}$ (Ceroici 1979).

Downstream of Edmonton the river flows through the Beverly Channel. Total dissolved solids in water from the Beverly Channel sands and gravels is less than 500 $mg \cdot L^{-1}$. The dominant cations in this water are calcium and magnesium, and iron concentrations are high. Bedrock water in the area is similar to that upstream of Edmonton. This is of a sodium bicarbonate type, with TDS usually ranging between 1000-2000 $mg \cdot L^{-1}$. Yields of water from the Beverly channel are high, ranging up to 7.6 $L \cdot s^{-1}$ (Stein 1976).

Within the Belly River Formation, groundwater yields vary greatly, but are generally in the low to moderate range. In contrast to yields upstream of Edmonton, the Horseshoe Canyon formation downstream of the city produces good yields from the highly fractured coal seams (Stein 1976).

2.6 Geomorphology, Channel Characteristics

Downstream of the Genesee Bridge, the river takes the form of a single channel, with few mid-channel gravel bars. The valley is narrow through this stretch. Between Devon and Edmonton, the channel wanders irregularly, and several bends are cut into high cliffs of weathered sandstone. Scour holes 2 to 3 m deep have formed on the outside of bends near Devon, and some bank slumping has resulted (Doyle and Thompson 1979).

Bed materials in the NSR are primarily gravel; particle sizes tend to decrease in the downstream direction, although bed materials at Devon and Edmonton are similar (Doyle and Thompson 1979). Between Edmonton and the Saskatchewan border, the bed material is also gravel, primarily quartzite. The median size of the gravel ranges from 0.25 mm to 23 mm with a modal size of 16 mm diminishing in downstream direction (Table 2.2). Below the gravel bed, from Edmonton to the border, the substrate consists of a 4 to 5 m thick gravel layer in the upper reaches, and layers of silty-clay and sandy silt in the lower reaches (Nwachukwu and Neill 1972).

There has been little alteration in the bed profile downstream of Edmonton. A comparison of surveys done in 1912 and again in the early 50's shows little change, and there appears to have been no further change due to recent major flood events.

TABLE 2.2 Summary* of bed material size near water's edge at various locations from the Saskatchewan border to Lodgepole, North Saskatchewan River.

River km	Location		Size (mm)**		
		D_{50}	D_{85}	D_{90}	Largest
550	Lodgepole, right side	74	193		350
484	Berrymoor Ferry, right	38	89		140
484	Berrymoor Ferry, left	41	70		150
443	Genesee Ferry, left	32	54		120
381	Devon Bridge, right	16	42		70
339	High Level Bridge, left	23		95	128
291	Ft. Saskatchewan, left	16		64	128
224	Warspite, left	16		61	128
80	Elk Point Bridge, left	12		64	128
8	N. Sask. border, right	0.25		0.40	16

---

* Adapted from Doyle and Thompson (1979) and Nwachukwu and Neill (1972)

** D_{50} = median size by weight

2.7 Soils

From the mountains to a point near Drayton Valley, the North Saskatchewan River flows through an area of grey wooded soils. These soils developed under forest. They are low in nutrients and organic matter and, consequently, are considered poor for agriculture (C.L.I. class 4 or lower). Additionally, this area (agroclimatic zone 5H) has a very short growing season, the average frost-free period being less than 60 days (Brocke 1977).

Further east in the NSR drainage basin, soil productivity potential and growing season improve. Between Drayton Valley and Edmonton, most of the soils are dark grey or dark grey-wooded. Most of these soils were formed when the tree cover was continuous and they form a transition zone between forest and parkland. The average frost-free period is 75-90 days (agroclimatic zone 3H and 2H).

In the Devon area, the soils south of the river developed from lacustrine material from Lake Edmonton. These chernozemic soils are high in productivity (C.L.I. class 1) and have no limitations for agriculture. The soils north of the river at Devon are grey wooded and dark-grey wooded and have developed on alluvial aeolian material (Brocke 1977, Bowser 1962). They are generally poor for agriculture.

Edmonton City lies on soil composed mainly of Malmo silty clay loam, an eluviated black soil which developed on the lacustrine material of Lake Edmonton. This region also contains pockets of black solonetzic soils associated with the black chernozems. In the vicinity of Edmonton City, the river flows through an area considered to be the best in the province for agriculture, with a growing season usually exceeding 90 days, adequate precipitation, and C.L.I. class 1 soils (Brocke 1977). Most soils in this area are chernozemic, except that solonetzic soils tend to dominate wherever the bedrock is near the surface. Black solonetzic soils are less productive agriculturally than black chernozems. Solonetzic soils are more saline, having a ratio of calcium to other ions of one or less, or having have 15% or more exchangeable sodium (Bowser 1962).

Below Edmonton and as far as the Saskatchewan border, the river flows through the northern edge of the black soil zone . In the stretch from Two Hills to Elk Point, the soils are grey-wooded and are, therefore, less productive. To the southeast of Edmonton City, the Cooking Lake moraine is primarily an area of podzolic or grey wooded soils that are unsuitable for agriculture and designated as C.L.I. classes 5 and 6 (Brocke 1977). Except for this latter area, the soil capacity is designated C.L.I. class 2-3.

2.8 Land Use

Natural vegetation in the Edmonton region is mainly aspen poplar and grasses, with jackpine in the sandy areas, white spruce and balsam poplar along the rivers and larger creeks, and black spruce, tamarack and birch in low, moist areas.

From west to east, the land in the NSR drainage basin is used increasingly for agriculture. Livestock production is the major agricultural activity in the area; most farms are of a mixed type.

The land from Drayton Valley to Devon is perhaps no more than 50% cleared for agriculture, whereas the land east of Devon to the border is mostly cleared. Additionally, the type of agriculture becomes more intensive toward the east, with greater proportions of land devoted to cereal crops and hay.

The agricultural land base in the immediate Edmonton area is gradually becoming urbanized, either as residential/industrial areas within and adjacent to the city limits, or as country residential developments in the rural areas between Edmonton and the fifteen urban communities surrounding the city.

2.9 Water Use

Water from the NSR is used in both consumptive and non-consumptive ways:

Consumptive Uses	Non-Consumptive Uses
Municipal Supply	Cooling (thermal power)
Industrial Supply	Dilution
Agricultural	Apportionment
	Recreation
	Fisheries

Water withdrawals and consumption for the section of the river between Devon and Fort Saskatchewan in 1981 are summarized in Table 2.3.

TABLE 2.3 Summary* of water withdrawals and consumption, North Saskatchewan River, Devon to Fort Saskatchewan, 1981.

Water Use	Quantity Withdrawn ($10^6 m^3 \cdot yr^{-1}$)	Consumption ($10^6 m^3 \cdot yr^{-1}$)
Cooling (thermal power)	414	2.3
Municipal Supply	87	18.2
Oilfield Activities	0.9	0.9
Refineries	9.4	6.9
Petrochemical	17.15	9.9
Metals Industry	4.17	2.4
Food and Beverage	4.75	0.40
Other Industries	11.33	2.76
Agricultural	3.36	3.23
	552	47.0

* from Canadian Resourcecon Ltd. 1982

The largest water withdrawal from this section of the river is for cooling thermal power generators (414 X 10^6 m^3 · $year^{-1}$ in 1981). The power plant at Clover Bar employs a once-through cooling system and approximately 99% of this water withdrawn is returned to the river. Most of the water used for cooling at the Rossdale generating plant is subsequently fed to the Rossdale Water Treatment Plant and, therefore, becomes part of the municipal water supply. Municipal water supply for the city of Edmonton and outlying towns accounts for the second largest withdrawal (87 X 10^6 m^3 · $year^{-1}$ in 1981). About 80% of this volume is returned to the river after passing through sewage treatment. Average annual total volume of flow in the NSR at Edmonton is 6181 X $10^6 m^3$; water consumption within the Devon to Ft. Saskatchewan section represents less than 1% of this total (Canadian Resourcecon Ltd. et al. 1982).

Reception of waste loads and effluents is a legitimate use of the NSR, because sewage treatment plants and industries are licensed by the province to discharge to the river (see Section 2.10). The licence requirements assume that there is sufficient assimilation capacity in the river, either to dilute wastes or to continue the treatment process by degradation or biological uptake.

There is very little agricultural use of NSR water in the study section of the river. Very small quantities are withdrawn for stockwatering and feedlot operations, for irrigation on sod and tree farms, and for growing alfalfa and vegetables. (Canadian Resourcecon Ltd. et al. 1982).

Alberta is required by the Prairie Provinces Water Board to supply 50% of the natural flow in the NSR at the border with Saskatchewan. This apportionment requirement excludes the effects of the two dams in calculating the required flow, but the reservoirs are used to ensure that the legal flow is attained. Additionally, the Board requires a minimum flow of 100 $m^3 \cdot s^{-1}$ in the river at the border to preserve in-stream uses (Crosby 1982).

Recreation is less important on the NSR than on other water bodies in the vicinity. According to Dykstra (1980), the most frequent water-based recreational activities on the NSR are canoeing and other types of boating. Fishing is of lesser importance. Eighteen recreation access sites are located within the city, and a few unofficial sites, such as Devon bridge, occur along the Devon-Pakan stretch.

Swimming in the river is not popular, probably because of the lack of beaches, the public opinion that the river is of poor quality, and the proximity of several lakes more suitable for swimming. However, a few accessible river sites upstream of the city are popular on warm summer days when algal blooms on lakes are common.

The river is not intensively used for fishing in spite of a fairly high population of goldeye, northern pike, walleye and sauger in the downstream reaches. The river provides the only significant stream fishing opportunity in the eastern half of the NSR basin, but Allan (1984) suggests that limited accessibility, the size of the river, and the public perception that the river is polluted inhibits this recreational use. Two recent studies do suggest that a number of chemical substances occur at low levels in the tissues of fish from the NSR (Alberta Environmental Centre 1983a, 1983b). Although these reports recommend consumption limits on certain sizes of some species of fish, especially for high risk persons (e.g. pregnant women), the concentration of pesticides, PCB's, and mercury were generally considered to be low and to meet safe consumption levels.

2.10 Potential Sources of Pollution to the River

There is a large and growing percentage of the land base devoted to urban and industrial developments in the Edmonton metropolitan area and, to a lesser extent, in a number of smaller population centres in the NSR drainage basin, especially in the central part of the basin where this study has its focus (Fig. 2.2). Within the Edmonton metropolitan region (which covers approximately the stretch of river between the Genesee bridge and the confluence of the NSR with the Redwater River) nearly 17% of the total land area in the NSR watershed was devoted to urban and industrial land uses in 1983 (Edmonton Metropolitan Regional Planning Commission 1983).

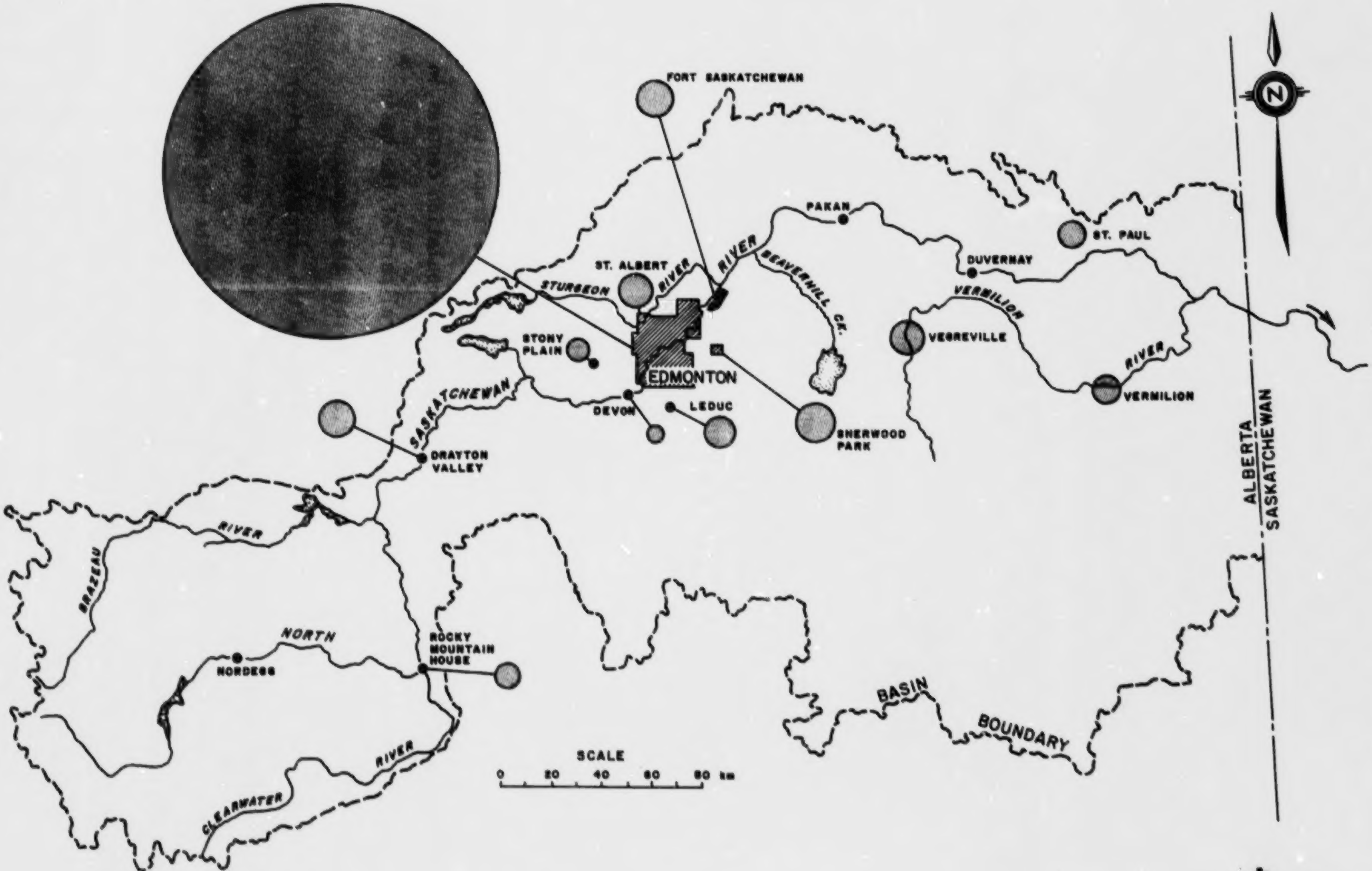

FORT SASKATCHEWAN
ST. ALBERT
STURGEON
RIVER
RIVER
BEAVERHILL CK.
PAKAN
ST. PAUL
DUVERNAY
VERMILION
VEGREVILLE
RIVER
VERMILION
STONY PLAIN
EDMONTON
DEVON
LEDUC
SHERWOOD PARK
SASKATCHEWAN
DRAYTON VALLEY
RIVER
BRAZEAU
NORTH
NORDEGG
ROCKY MOUNTAIN HOUSE
RIVER
CLEARWATER
BASIN
BOUNDARY
SCALE
0 20 40 60 80 km
ALBERTA
SASKATCHEWAN
N

Fig. 2.2 North Saskatchewan River drainage basin showing relative sizes of major population centres.

(Source : ATLAS OF ALBERTA)

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

High concentrations of industrial and domestic activity generate large volumes of effluents from industrial plants, sewage treatment plants, and storm and combined sewers (Fig. 2.3). The major effluents in these groups are listed in Section 4.0. Industrial and sewage treatment plant effluents are concentrated as point sources, most of which discharge continuously throughout the year. If such effluents are discharged into rivers, concentrations of pollutants tend to be inversely related to river flow volumes. All municipal and industrial point-source discharges, except storm sewers, are regulated by Alberta Environment. Under the Clean Water Act (Revised Statutes of Alberta 1980, Chapter C-13), these point-sources are granted a License to Operate by the Standards and Approvals Division, and are monitored by the Pollution Control Division.

There are approximately 220 storm water and combined outfalls within the boundaries of the City of Edmonton. Most of these drain directly into the NSR valley; others discharge into ravines (especially Whitemud Creek and Mill Creek) or stormwater retention ponds. Currently, a joint task force from the City of Edmonton and the Province of Alberta is investigating relationships among storm, combined, and sanitary sewage networks. The task force has identified many storm outfalls which may have an impact on river water quality upstream of the City of Edmonton's Rossdale Water Treatment Plant. A report is being prepared on this investigation (L North, pers. comm.).

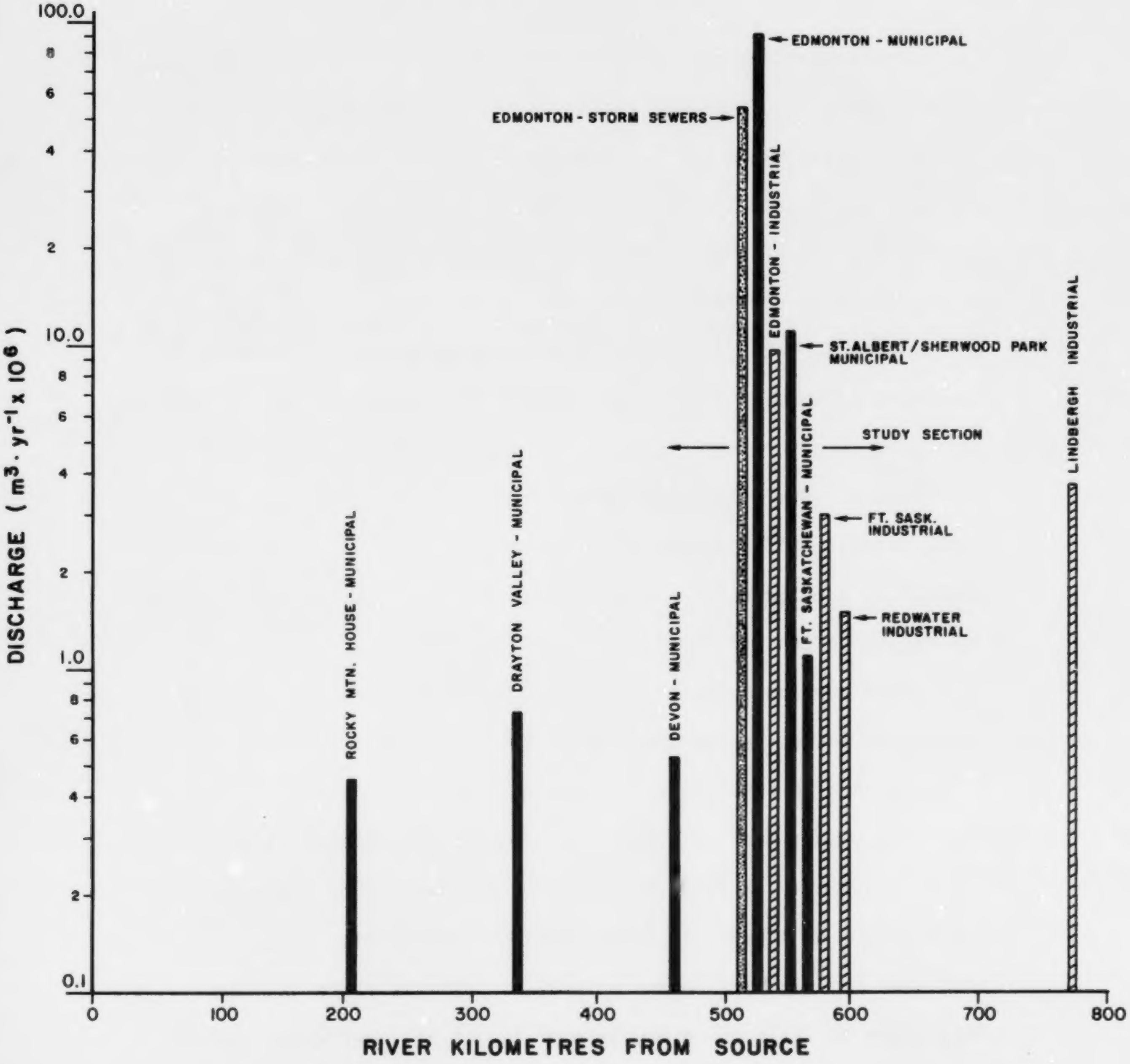


Fig. 2.3 Estimated mean annual discharge from point sources on the North Saskatchewan River during study period, 1982 - 1983.

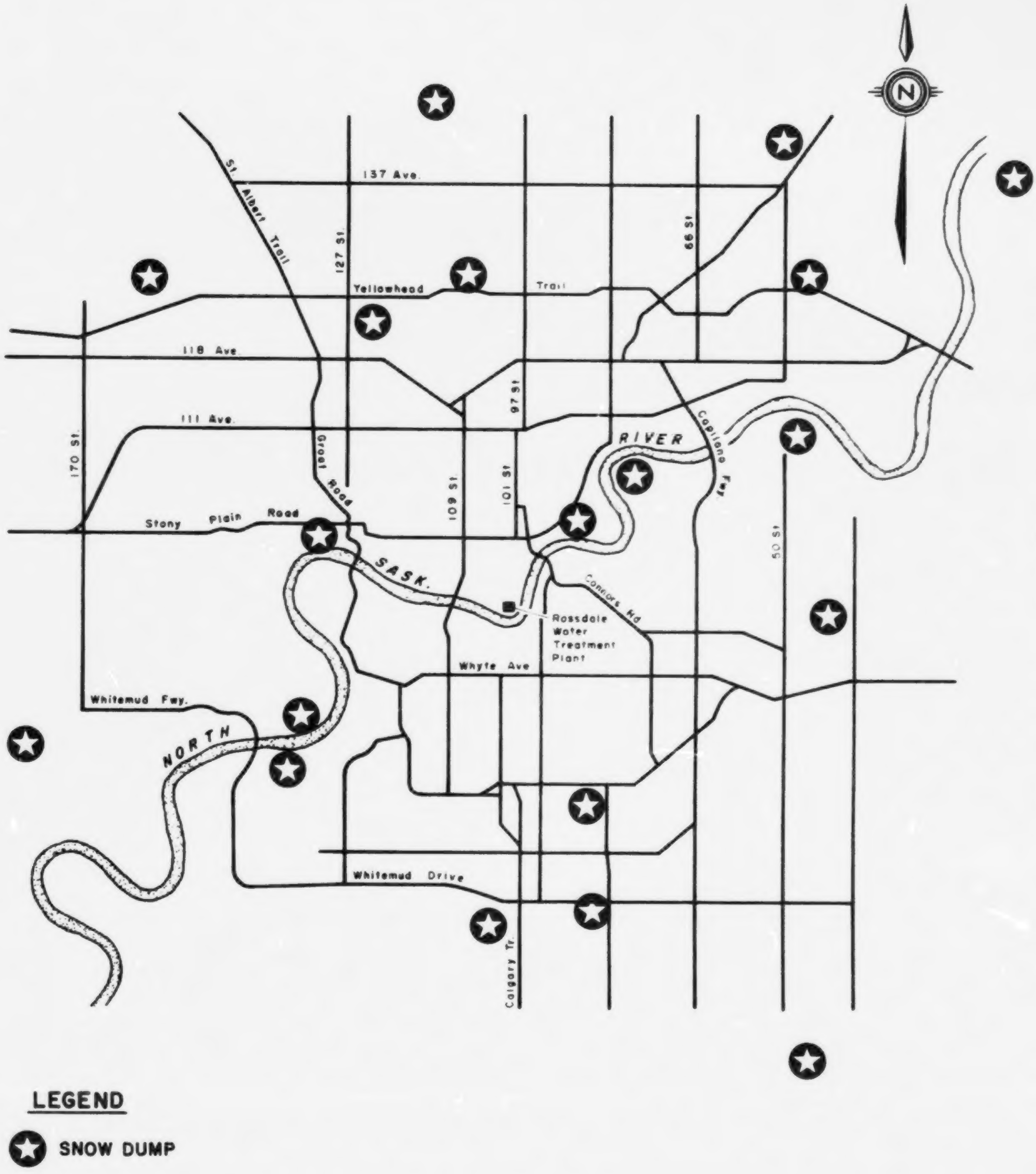
Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

The Town of Devon has four stormwater outfalls, all of which drain directly into the NSR (W. Culshaw, pers. comm.). The City of Fort Saskatchewan has 15 stormwater outfalls, seven of which drain to the NSR and eight of which drain into the Ross Creek ravine (F. Daskewech, pers. comm.).

Since the field work for this study was completed, changes have been implemented concerning the treatment and disposal of sewage from a number of smaller population centres around Edmonton. Sewage from Leduc, Nisku, and Beaumont is no longer treated locally and discharged into the Blackmud/Whitemud Creeks drainage system. Instead, sewage from these three population centres now flows to the Gold Bar Wastewater Treatment Plant (GBWTP) via the new Southeast Regional Trunk Sewer. A new Capital Region Sewage Treatment Plant was designed to consolidate the functions of the St. Albert and Bremner sewage lagoons, and to service part of northeast Edmonton. The new plant began to receive sewage from Sherwood Park in November 1984, and from St. Albert in May 1985. The City of Edmonton completed connections to the new plant in June 1985.

Potential sources of pollution in the NSR come not only from identifiable point sources, but also from diffuse sources reflecting various land uses and surface runoff patterns which depend on storm events and spring snowmelt. Potentially polluting substances are carried in runoff from lands used for agriculture and forestry, from paved and roofed areas, and from changed drainage patterns due to diversion and construction. Such diffuse runoff is widespread in the NSR drainage basin; consequently, non-point sources of pollutants are much more difficult to pinpoint. In many instances, the effects from diffuse sources are clearly associated with seasonal runoff or storm events, because there is usually little or no input of pollutants from most diffuse sources during periods of low or no runoff or precipitation.

Superimposed on the spring surface runoff and the flows from storm and combined sewers is the meltwater from the eighteen major snow dumps operated by the City of Edmonton (Fig. 2.4). Effluent volumes from melting snow dumps are variable and diffused over time and space, depending on annual snow accumulation, spring weather conditions, and snow dump locations. The City of Edmonton has maintained these snow disposal sites for several years under a License to Operate issued by Standards and Approvals Division, Alberta Environment. A stipulation of this license is that an environmental testing program be carried out on one of the river sites each year.



N
137 Ave.
St. Albert Trail
127 St.
66 St
Yellowhead
Trail
118 Ave.
111 Ave.
170 St.
Groat Road
109 St
97 St
101 St
RIVER
Capilano Fwy.
Stony
Plain
Road
SASK.
Connors Rd
Rossdale
Water
Treatment
Plant
50 St
Whyte Ave
Whitemud Fwy.
NORTH
Whitemud Drive
Calgary Tr.
LEGEND
SNOW DUMP

Fig. 2.4 Arterial map of the City of Edmonton showing the location of snow dumps.

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

3.0 MIXING PROCESS IN THE NORTH SASKATCHEWAN RIVER

The mixing process in rivers is a complex phenomenon. It depends on the interaction of many physical and hydrological characteristics unique to each river. A basic knowledge of the mixing process is vital to an understanding of the impacts on water quality of various municipal or industrial effluents entering a river. Although no new investigations of the fates of various municipal or industrial effluents were undertaken during the 1982-1983 survey of the NSR, some mixing studies were carried out previously on the section of the river under study. This part of the report is an overview of the current knowledge of the mixing process in the NSR in the vicinity of Edmonton.

Three in situ investigations of mixing characteristics have been carried out on the North Saskatchewan River. Berner et al. (1971) investigated the lateral mixing patterns of sewage and industrial effluents using the chloride ion (which is present at elevated levels in many effluents) and the fluorescent dye Rhodamine WT as tracers. The chloride ion study was carried out on the 68 km section of the river between the 105 Street Bridge in Edmonton and the Vinca Bridge. Surveys were conducted during the summer of 1971 under "high" flow conditions (500 - 600 $m^3 \cdot s^{-1}$). The Rhodamine WT survey was carried out on the 58 km section between the Gold Bar Wastewater Treatment Plant (GBWTP) and the old Vinca Ferry site.

Three chloride surveys were carried out. The first, conducted from the GBWTP to a point 14 km downstream (Clover Bar Gravel Pits), revealed that a marked transverse gradient existed from south (right bank) to north (left bank) immediately below the GBWTP outfall, and persisted to the end of the run. The second survey, conducted from Fort Saskatchewan to Vinca, revealed that all right bank municipal and industrial inputs from Fort Saskatchewan were poorly mixed laterally by the time the water mass reached Vinca. The third survey, conducted between the old Clover Bar Lagoons and the Fort Saskatchewan Bridge revealed better but still incomplete mixing of the chloride originating from the lagoons. Unlike the other two river sections, this latter mid-section has several strong switchback curves and a stretch of shallow rapids. Vertical mixing appeared to be rapid in all cases.

The surveys carried out with Rhodamine WT confirmed the chloride observations. The authors concluded that any pollutant introduced in the Edmonton area that was not mixed at Fort Saskatchewan would almost certainly not be mixed at Vinca. They also conclude that a pollution gradient, with severity decreasing from right bank to left bank, existed from Edmonton to at least Vinca Bridge.

The second investigation of mixing processes in the NSR was conducted by Pospisilik (1972) during winter low flow and included ice-cover conditions. His research confirmed the poor mixing between Fort Saskatchewan and Vinca but indicated a rather uniform distribution of pollutants at the Fort Saskatchewan Bridge.

The third investigation was also carried out under lower flow conditions (150 - 200 $m^3 \cdot s^{-1}$) in October, 1977, by Beltaos and Anderson (1979). The objective of their study was to determine in situ transverse mixing coefficients for the NSR for use in a predictive mixing model. The authors concluded that the NSR displayed very low transverse mixing coefficients which were closer to straight laboratory flume coefficients than those commonly measured in natural streams. They attributed this characteristic to the mild sinuosity of the river.

Consequently, the river is poorly mixed in the section from Edmonton to Vinca, a distance of approximately 70 km, with the exception of the section of river extending approximately 7 km upstream from the Fort Saskatchewan Bridge to the mouth of Pointe aux Pins Creek. Here the river has two consecutive severe bends which cause a localized increase in the transverse mixing coefficient, well above the section average.

The three studies cited are in general agreement that the NSR (as a receiving stream) exhibits poor mixing capability downstream of the City of Edmonton. Effluents discharged within Edmonton and the Clover Bar area have the potential to be mixed by the sharp bends at Point aux Pins Creek although the thoroughness of mixing could be dependent upon river flow at the time of discharge. Discharges into the NSR within and immediately downstream of Fort Saskatchewan are likely to be only partly mixed by Vinca.

4.0 THE STUDY AREA AND STUDY DESIGN

For reasons explained in the introduction, this study concentrated on the section of the North Saskatchewan River (NSR) extending from a location immediately upstream of the Highway 60 bridge at Devon to a downstream location 100 m upstream of the Pakan Bridge near Victoria Settlement (Fig. 4.1). The major industrial effluents entering this section of the NSR are listed in Table 4.1; the municipal sewage effluents are listed in Table 4.2. Major effluent locations are also shown in Figure 4.1. The main historic, geologic, geographic, and related characteristics of the NSR basin and the mixing processes in the study section of the river are described in previous sections on basin characteristics (Section 2.0) and mixing (Section 3.0).

Sampling was done during the 1982 and 1983 field seasons, the latter being extended to include two winter dates in 1984. A list of the eleven regular sampling locations in the NSR for 1982 is given in Table 4.3; for reasons explained below, only six of these locations were sampled regularly in 1983. Study locations are shown in Figure 4.1. The most upstream and downstream locations were chosen to represent relatively unimpacted (control) sites and sites within the recovery zone, respectively. The other nine locations were selected on the basis of their representativeness and value in identifying potential impacts from certain known discharges. At each sampling location, three sampling sites were established: right bank, left bank, centre channel. For two variables (zoobenthos and epilithic

TABLE 4.1 Major Industrial Effluents Entering the NSR in the Vicinity of Edmonton City.

I1. E. L. SMITH WATER TREATMENT PLANT

I2. UNIVERSITY OF ALBERTA (THERMAL)

I3. ROSSDALE POWER PLANT

I4. ROSSDALE WATER TREATMENT PLANT

I5. STELCO

I6. C.I.L.

I7. IMPERIAL OIL REFINERY

I8. SYNCRUDE RESEARCH

I9. TEXACO REFINERY

I10. GULF REFINERY

I11. CELANESE CANADA, UNIROYAL, FIBERGLASS

I12. CLOVERBAR POWER PLANT

I13. ALBERTA CONCRETE, NESBIT

I14. ALBERTA FOOD PRODUCTS

I15. MANVILLE CANADA INC.

I16. SHERRITT GORDON

I17. UNION CARBIDE

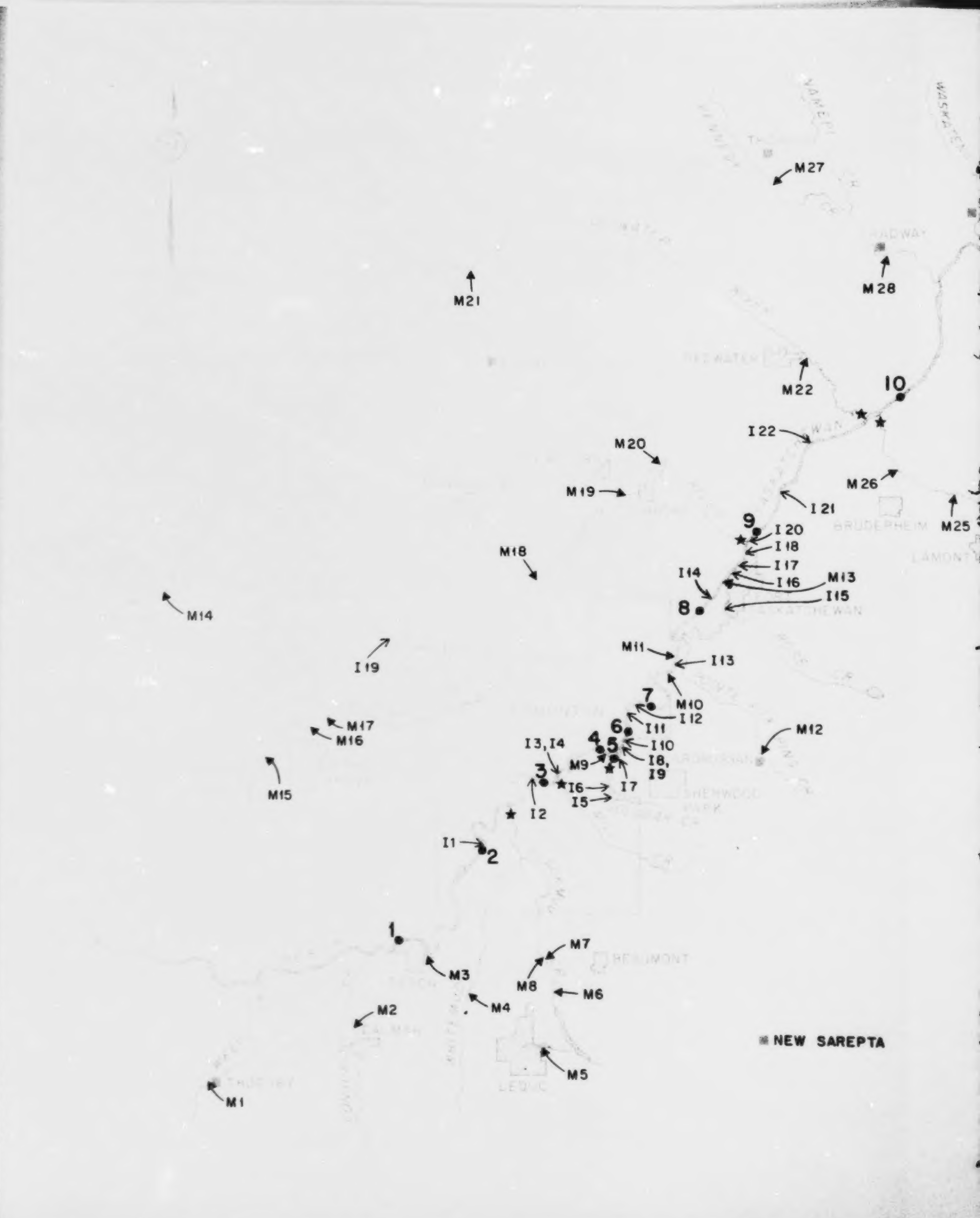
I18. DOW CHEMICAL

I19. ALBERTA CONCRETE, VILLENEUVE

I20. DIAMOND SHAMROCK

I21. SHELL REFINERY, SCOTFORD

I22. ESSO CHEMICALS, REDWATER



M27
RADWAY
M28
M21
REDWATER
M22
10
I22
M20
M26
M19
I21
9
I20
I18
BRUDERHEIM
M25
LAMONT
M18
I17
I14
I16
M13
I15
8
SASKATCHEWAN
M14
M11
I13
I19
M10
7
I12
M17
6
I11
M16
M12
4
5
I10
I3, I4
I8,
I9
M9
3
I7
M15
I6
I5
SHERWOOD
PARK
I2
I1
2
1
M7
BEAUMONT
M3
M8
M6
M4
M2
CALMAR
M5
THORSBY
M1
LEDUC
NEW SAREPTA

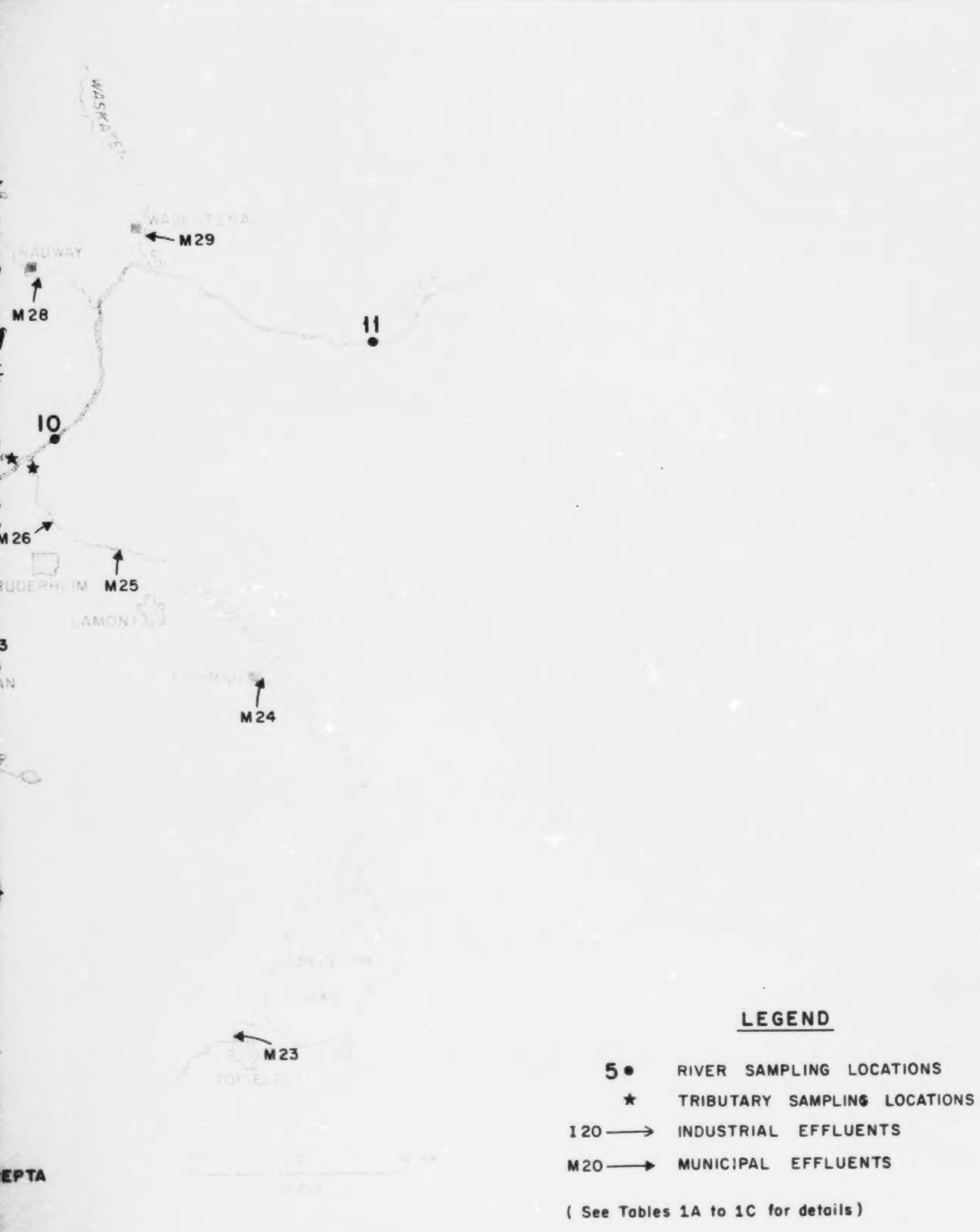

WASKATENAU
WASKATENAU
M29
RADWAY
M28
11
10
M26
M25
BRUDERHEIM
LAMONT
M24
M23
EPTA
LEGEND
5 ● RIVER SAMPLING LOCATIONS
★ TRIBUTARY SAMPLING LOCATIONS
I 20 ⟶ INDUSTRIAL EFFLUENTS
M 20 ⟶ MUNICIPAL EFFLUENTS
(See Tables 1A to 1C for details)

Fig. 4.1 North Saskatchewan River study area.

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

TABLE 4.2 Municipal Sewage Effluents Entering the NSR directly or indirectly in the Vicinity of Edmonton City.

M1. THORSBY
M2. CALMAR
M3. DEVON SEWAGE TREATMENT PLANT
M4. INTERNATIONAL AIRPORT
M5. LEDUC
M6. NEW SAREPTA
M7. BEAUMONT
M8. NISKU
M9. GOLD BAR WASTEWATER TREATMENT PLANT (GBWTP), EDMONTON
M10. BREMNER SEWAGE LAGOONS
M11. ST. ALBERT SEWAGE LAGOONS
M12. ARDROSSAN
M13. FORT SASKATCHEWAN
M14. ONOWAY
M15. STONY PLAIN
M16. PARKLAND VILLAGE
M17. SPRUCE GROVE
M18. MORINVILLE
M19. BON ACCORD
M20. GIBBONS
M21. LEGAL
M22. REDWATER
M23. TOFIELD
M24. CHIPMAN
M25. LAMONT
M26. BRUDERHEIM
M27. THORHILD
M28. RADWAY
M29. WASKATENAU

TABLE 4.3 Regular River Sampling Locations, NSR, 1982 and 1983.

Location Number	Location Name	Relative River Kilometres	Location Description	Selection Criteria
1.	DEVON	0	200 m upstream of Devon Bridge on Highway 60	Control site (background conditions)
2.	E. L. SMITH PLANT*	24	Immediately upstream E.L. Smith water treatment plant	To determine impacts from Devon municipal effluent on water supply
3.	ROSSDALE*	40	100 m downstream of 105th St. Bridge-Rossdale	To determine impacts from large separate storm sewers on water quality for Rossdale Water Treatment Plant
4.	50TH STREET FOOTBRIDGE	51	100 m upstream of 50th St. Footbridge	To identify impacts from large combined storm sewers before Gold Bar Wastewater Treatment Plant
5.	RUNDLE FOOTBRIDGE*	52	100 m downstream of Rundle Park Footbridge	To identify impacts from Gold Bar Wastewater Treatment Plant prior to industrial discharges
6.	BEVERLY BRIDGE	55	200 m downstream Beverly Railway Bridge	To incorporate effects of industrial - part refinery discharges
7.	CLOVER BAR*	61	4 km downstream of Celanese downstream of Clover Bar	To incorporates all municipal and industrial effluents from Edmonton
8.	FORT SASKATCHEWAN BRIDGE	79	200 m upstream Fort Saskatchewan Railway Bridge	Downstream of St. Albert and Bremner lagoons
9.	STURGEON*	89	Downstream of confluence with Sturgeon River	To include effects of Fort Saskatchewan industrial and municipal effluents
10.	VINCA BRIDGE	112	500 m downstream of Vinca Bridge	To reflect all major inputs; also robot monitor location
11.	PAKAN BRIDGE	163	100 m upstream of Pakan Bridge	Site reflecting complete mixing in the river; also a routine monitoring site

* designates locations not sampled in 1983

chlorophyll-a), only the left-bank and right-bank sites were used. For some chemical variables at each of the two most upstream locations, samples from the three sites were combined into a simple composite sample on each sampling occasion.

Although there are dams, agricultural and oilfield developments, and some population centres (Rocky Mountain House and several smaller centres) upstream of Devon, the NSR at the Devon bridge is considered relatively unimpacted by domestic and industrial waste effluents (unpublished data, Alberta Environment). The first sampling location is upstream of the Devon Sewage Treatment Plant, near an Alberta Environment River Water Quality Monitoring Network station.

The mixing studies reviewed in the previous section have indicated incomplete mixing as far downstream as Vinca bridge on Highway 38. However, it is assumed that mixing is complete most or all of the year at the Pakan Bridge near Victoria Settlement. Another reason for selecting this as the lower sampling location is that it is also a routine station of the River Water Quality Monitoring Network.

For study design purposes and for reasons noted in the introduction (Section 1.0), the river was considered to have three components: the flowing water component, the river bed or sediment component, the biological component.

The flowing water component included the water and its non-living dissolved and suspended load. Table 4.4 summarizes the chemical variables measured in 1982 and the sampling dates for that year; some biological and physical variables sampled on the same dates are also included in this table. Table 4.5 is a summary of the water component

TABLE 4.4 Variables for which analyses were performed, NSR, 1982 field season.

PHYSICAL

Temperature (Field)
Depth (Field)
Flow

MAJOR IONS & RELATED

pH
Conductivity
(Field, Lab)
Dissolved Oxygen
(Field)
Calcium
Hardness
Sodium
Potassium
Silica
Chloride
Fluoride
Sulphate
Carbonate
Bicarbonate
Alkalinity
TDS
T.R.
F.R.
NFR
BOD
COD
TOC
DOC
TPC
DIC

NUTRIENTS

Phosphorus (total)
Nitrogen (total)
Ammonia (total)
Nitrite
Nitrite-Nitrate
TKN
TON

METALS

Mercury
Cobalt
Copper
Nickel
Cadmium
Lead
Zinc
Beryllium
Aluminum
Arsenic
Selenium
Chromium
Manganese
Molybdenum
Vanadium
Iron

ORGANICS

PCBs
Phenols
Pesticides & Herbicides

- BHC
- Aldrin
- O.P., D.D.T.
- P.P., D.D.T.
- 2, 4-D
- 2, 4,S-T
- Dieldrin
- M.C.P.A.
- Endrin
- Dursban
- Heptochlor
- Hexachlorobenzene
- Lindane
- Tordon
- Methoxychlor
- Diazinon
- Methylparathion
- Dimethoate
- Heptochlor expoxide
- Malathion

BIOLOGICAL

Coliforms
Fecal Coliforms
Fecal Streptococci
Standard Plate Count

SAMPLING DATES

18-19/05/82*
01-02/06/82*
15-16/06/82*
29-30/06/82*
13-14/07/82*
27-28/07/82*
10-11/08/82*
24-25/08/82**
08-09/09/82**
05-06/10/82
19-20/10/82**
02-09/11/82

---

* selected analyses (see Table 5.2) by City of Edmonton on dates noted.

** analyses (see Table 5.2) by AEC, Vegreville, on dates noted.

TABLE 4.5 Variables for which analyses were performed, NSR, 1983 field season.

PHYSICAL

Temperature (Field)
Depth (Field)
Flow

MAJOR IONS & RELATED

pH
Conductivity
(Field, Lab)
Dissolved Oxygen
(Field)
Calcium
Magnesium
Hardness
Sodium
Potassium
Silica
Chloride
Fluoride
Sulphate
Carbonate
Bicarbonate
Alkalinity
TDS
T.R.
F.R.
NFR
Cyanide
BOD
COD
DIC
DOC
TPC

NUTRIENTS

Phosphorus (total)
Nitrogen (total part.)
Ammonia dissolved
Nitrite
Nitrite-Nitrate
TKN

METALS

Mercury
Cobalt
Copper
Nickel
Cadmium
Lead
Zinc
Beryllium
Aluminum
Arsenic
Selenium
Chromium
Manganese
Molybdenum
Vanadium
Iron

ORGANICS

PCBs*
Phenols

PRIORITY POLLUTANT SCAN*

Extractables-79 compounds
Purgeable - 24 compounds
Chlorinated Pesticides
Chlorinated Herbicides
Organophosphorus Pesticides
Organonitrogen Pesticides

SEDIMENT PHASE*

Priority Pollutant Scans
Extractables (79)
Chlorinated Pesticides
Chlorinated Herbicides
PCBs
Metals

BIOLOGICAL

Coliforms
Fecal Coliforms
Fecal Streptococci
Standard Plate Count
Chlorophyll
  Benthic Algae
  Plankton

SAMPLING DATES

17-26/05/83	01-02/06/83	14-16/06/83
28-29/06/83	13-14/07/83	03-04/08/83
23-24/08/83	20-21/09/83	12/10/83
15-17/11/83	01-02/02/84	01-02/03/84

---

* once only, 5-6 October, 1983

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

sampling dates and variables measured in 1983 including, as in 1982, some biological and physical variables on the same dates. The changes in variables measured from 1982 to 1983 were due to some difference in the analytical facilities used and to some changes in analytical techniques and detection limits made to comply with conditions determined for the NSR in 1982. For example, the City of Edmonton Laboratory detection limits for nitrogen compounds were too high for the low concentrations found at upstream sites and, consequently, many 1982 results are listed as "not detectable". Analyses for nitrogen compounds were done by the Alberta Environmental Centre (AEC) Laboratory in 1983.

There were also some differences in the sampling regimes for 1982 and 1983. In 1982, eleven locations comprising 33 sites were sampled; each location included a left-bank, a right-bank, and a centre-channel site. The 1982 study was planned as a broad characterization of the study area; all sampling sites were in the mainstem of the NSR. The intention was to assess the interpretive value of sites, bank-to-bank (lateral) variations in water quality, and longitudinal and seasonal variations in water quality.

Prior to the 1983 sampling season, the preliminary results from 1982 were reviewed and the sampling program was revised to achieve the broad objectives of the study most expediently. Five sampling locations were dropped in 1983; these locations were considered to be redundant in defining zones of impact or recovery. In order to assess the impacts of a number of point-source discharges, several industrial and municipal effluents and a number of tributaries entering the NSR within the study area were sampled in 1983; these are summarized in Table 4.6. The physical and chemical variable measured at the point-source discharge sites were essentially the same as for the mainstem NSR sites for 1983.

Flow data are needed before calculating loading from various point sources. For the NSR and for several tributaries in the study area, flow data were obtained from records published by the Water Survey of Canada (Environment Canada 1983, 1984a, 1985). The mainstem NSR station is at the Low Level Bridge in the City of Edmonton; tributary stations are maintained at Whitemud, Blackmud, and Beaverhill creeks, and at Redwater and Sturgeon rivers.

The riverbed sediment component was not investigated extensively in this study. A single survey was conducted on 5-6 October, 1983; sediment samples collected were analyzed for certain organics and metals for the purpose of determining the interpretive value of such data and assessing the need for additional data collection. Metal analyses included lead, copper, nickel, arsenic, cadmium, mercury, zinc, and chromium; organics included priority pollutant scans, extractables (79), chlorinated pesticides, chlorinated herbicides, and PCBs.

Three aspects of the biological component were investigated: the bacteria in the flowing water; chlorophyll-a in the flowing water and on the surface of riverbed material; the invertebrate community living in and on the riverbed material. The bacterial investigations were

TABLE 4.6 Summary of sampling events and variables assessed in tributaries and effluents to the NSR, 1983.

Tributary Streams	No. of samplings	Variables
Whitemud Creek	9	Same as NSR sites 1983 Excluding: - Benthic algae chlorophyll-a - Priority pollutants - Pesticides - Herbicides
Mill Creek	4	
Fulton Creek	4	
Gold Bar Creek	7	
Sturgeon River	9	
Redwater River	9	
Beaverhill Creek	6	
Municipal Effluents		
Devon STP	10	Same as NSR sites 1983 Excluding: - Priority pollutants - Pesticides - Herbicides - Chlorophyll-a
GBWTP	10	
Bremner Lagoons	5	
St. Albert Lagoons	7	
Fort Sask. Lagoons	8	
Industrial Effluents		
Imperial Refinery	2	Same as NSR sites 1983 Excluding: - Chlorophyll-a
Texaco	2	
Gulf	2	
Celanese, Fiberglas, Uniroyal	2	
Alberta Food Products	2	
Union Carbide	2	
Sherritt Gordon	2	
Dow Chemical	2	
Diamond Shamrock	2	
Esso Chemical	2	

conducted in both 1982 and 1983 on the same schedule as the chemical sampling and included mainstem NSR sites, tributaries, and municipal effluents. A summary of bacterial analyses performed and sampling dates is given in Tables 4.4 and 4.5. The main purposes of this part of the overall study were to provide a general characterization of the bacterial flora in the section of the NSR under study, to provide data for comparison with Alberta Surface Water Quality Objectives, and to provide information useful in determining point sources.

The chlorophyll-a survey was conducted in 1983 only, and on the same schedule as the chemical sampling (Table 4.5). The flowing-water chlorophyll-a provides an estimate of the biomass of potamophytoplankton (free-floating microscopic algae); the chlorophyll-a from the surface of bottom materials gives an estimate of the biomass of epilithic algae growing on rocks and other submerged surfaces. Developmental patterns in these two forms are helpful in appraising growth inhibition or enhancement due to point-source inputs of nutrients and other dissolved substances, and such factors as temperature changes, sedimentation, and light penetration. The advantage of epilithic algae over potamophytoplankton is that, because they remain fixed to the substrate, the epilithic algae reflect the accumulated effects of dissolved substances and changing conditions over a long time period. As noted in the introduction, a macrophyte survey was not included in the 1982-1983 study because no extensive or persistent macrophyte development had been observed in the NSR.

A rather extensive zoobenthic monitoring program was undertaken in 1982 to complement the monitoring of chemical and physical variables. Chemical analyses permit the detection and quantification of a wide range of pollutants and their point sources in a river, but they reflect conditions at the time of sampling only. Zoobenthic organisms are exposed to fluctuations in water quality over an extensive period of time; therefore, the zoobenthos tends to act as an integrator of changes in water quality over time through a complex of responses reflecting tolerance limits. The rather low mobility potential of most zoobenthic taxa makes this group more useful as an indicator of water quality than the more mobile fish or zooplankton, which can move away from adverse conditions in a section of a river. Because of this integrator quality and because of the relative longevity of most zoobenthic taxa (several months to two or more years), it was neither necessary nor practical to sample zoobenthos with the same frequency that water samples were taken for chemical analysis. Details of the zoobenthic part of the biological component are treated in Part Two of this report.

5.0 GENERAL METHODS

5.1 Field Methods

For water chemistry, bacterial, and chlorophyll sampling during the open-water season, mainstem river and tributary sites were reached by means of an inboard-motor river jet boat. Each sampling event took two days: the first day included upstream sites (Devon to Beverly Bridge); the second day included downstream sites (Edmonton Cloverbar to Pakan).

All mainstem river and tributary samples for water chemistry analysis were collected with a stainless steel sampling bucket as surface grab samples. Each sample was subsampled directly into a specially prepared sample bottle, preserved, and handled according to the recommended procedures of the Research Laboratory, Alberta Environmental Centre (AEC), Vegreville. Field filtration was not performed on samples for dissolved nutrients. Water samples for chemical analysis were kept on ice in coolers in the field and transported to the Research Laboratory, AEC, within 24 hours. As noted below, a few variables were analyzed elsewhere in 1982.

In all cases, industrial and municipal effluent samples were collected as grab samples from the final effluent stream, either at the river outfall location if access was possible, or from a plant access point. The effluent from the Gold Bar Wastewater Treatment Plant (GBWTP) was collected as a 24-hour composite sample from the final effluent using a Manning Stationary Composite Sampler model no. S-5200-0-C-0-A-0 (S. Banerjee, pers. comm.).

Measurements of water temperature, specific conductance, and dissolved oxygen were taken with a Model 4041 Hydrolab meter at each sampling site on all sampling occasions except one, when sampling was done from bridges during the ice-flow period. The Hydrolab meter was calibrated prior to each sampling trip. The NAQUADAT codes for field variables measured are: depth - 97551F; temperature - 02065F; dissolved oxygen - 08102F; specific conductance - 02042F (Environment Canada 1984b). In the latter part of November during periods of ice flow, samples were collected from bridge locations wherever possible by lowering a stainless steel bucket into the river from the bridge walkway. Bridge sampling locations included Devon, 105th Street, 50th Street Footbridge, Beverly, Fort Saskatchewan, Vinca, and Pakan bridges. Mid-winter samples (February and March, 1984) were collected from left- and right- bank sites for each mainstem location by walking a safe distance from shore on the ice, drilling a hole with an ice auger, and collecting a sample in a stainless steel bucket.

As outlined in the study design, eleven mainstem NSR locations were sampled in 1982, and six in 1983 (see Table 4.3 and Fig. 4.1). Discrete samples were collected for analysis from each of three sites at each location (i.e. left-bank, right-bank, and centre-channel sites). In 1982, however, samples for the three sites at each of the two upstream locations (Devon and E. L. Smith) were combined into composite samples for analysis because preliminary data showed little lateral difference. Discrete samples from each site at the other nine locations were analyzed separately.

Sediment samples were collected for chemical analysis only once (5 and 6 October, 1983). Samples were collected at the six mainstem NSR sites sampled routinely during 1983 for other variables. Samples were collected by means of a stainless steel "air-lift" sampler using nitrogen gas. The sediment was sampled to a depth of 10 cm, governed by the depth of the sampler collector cup. The samples were allowed to settle for 24 h, after which the supernatant water was removed and the sediment samples transferred to solvent-washed, oven-dried, wide-mouth amber glass jars with teflon liners under the lids. Samples were kept in a cooler or refrigerator at 2 to 5°C and transported to the Alberta Environment Centre (AEC), Vegreville, as soon as possible.

Samples for the analysis of organic compounds were collected, preserved, and handled according to procedures outlined in Longbottom and Litchenberg (1982). Water samples for trace organics and pesticide chemicals were collected directly into solvent-washed, oven-dried amber glass bottles with aluminum-lined caps.

Samples for bacterial analysis were collected directly into one-litre sterilized polypropylene bottles at a depth of one meter; the sample bottles were held in a special stainless steel sampling cradle which permitted sampling at the appropriate depth.

Samples for potamophytoplankton chlorophyll-a analysis were taken from surface grab samples on the regular sampling dates in 1983 which are listed in Table 4.5.

Samples for epilithic algal chlorophyll-a analysis were collected from left-bank and right-bank sites at each sampling location in 1983. At each site, ten stones were collected randomly on a transect perpendicular to the shoreline. Each stone was scrubbed entirely with a small, hard-bristled brush and rinsed with distilled water until all visible epilithic growth was removed. The volume of slurry obtained from the scrubbing of all stones collected from one sampling location was recorded, after which the slurry was homogenized. From each sample, one 50 ml subsample was filtered onto a Whatman GFC filter; powdered magnesium carbonate was added during filtration. Filters were wrapped in aluminum foil and stored on ice until returned to the laboratory.

Field methods used in the collection of zoobenthic samples are given in Part Two of the report.

5.2 Laboratory Methods

In 1982, most chemical analyses were carried out by the Research Laboratory, Alberta Environmental Centre (AEC), Vegreville. In 1983, all chemical analyses were performed by AEC. The NAQUADAT codes for analyses performed by AEC are summarized in Table 5.1 (Environment Canada 1984b). In 1982, some analyses were performed by the City of Edmonton Laboratory or by the Pollution Control Division, Alberta Environment, Edmonton. The NAQUADAT codes for 1982 analyses other than those done by AEC are given in Table 5.2. The NAQUADAT Dictionary of Parameter Codes (Environment Canada 1984b) summarizes the analytical methods.

TABLE 5.1 Summary of Analytical Methods (AEC, 1982-1983)

Variable	NAQUADAT Code	Detection Limit ($mg \cdot L^{-1}$)
pH	10301L	
Specific Conductance $uS \cdot cm^{-1}$	02041L	
Non-Filterable Residue	10407L	2.0000
Residue, Total	10474L	0.0100
Total Dissolved Solids	00205L	
Alkalinity, T. as $CaCO^3$	10101L	5.0000
Hardness, T. as $CaCO^3$	10602L	5.0000
Bicarbonate	06201L	5.0000
Carbonate	06301L	5.0000
Calcium	20110L	1.0000
Magnesium	12102L	1.0000
Sodium	11103L	1.0000
Chloride	17203L	1.0000
Sulphate	16306L	5.0000
Potassium	19103L	0.2000
Fluoride	09107L	0.0500
Nitrogen, T. as N	07601L	0.0500
Nitrogen Ammonia, Diss. as N	07562L	0.0500
Nitrogen NO_3 + NO_2, Diss. as N	07105L	0.0500
Nitrogen NO_2, Diss. as N	07205L	0.0010
Nitrogen T. Kjeldahl as N	07021L	0.0500
Nitrogen T. Partic. as N	07906L	0.0100
Phosphorus, T. as P	15421L	0.0060
Silica Reactive	14102L	0.5000
Carbon Inorganic, Diss.	06154L	1.0000
Carbon Organic, Diss.	06107L	0.4000
Carbon Partic., Diss.	06905L	0.0100
Phenolics	06537L	0.0020
Cyanide	06608L	0.0020
Mercury, T.	80015L	0.0001
Cadmium, T.	48009L	0.0010
Arsenic, T.	33005L	0.0002
Copper, T.	29009L	0.0010
Lead, Ext.	82302L	0.0030
Manganese, T.	25003L	0.0080
Nickel, T.	28009L	0.0010
Zinc, T.	30009L	0.0010
Selenium, T.	34005L	0.0002
Molybdenum, T.	42009L	0.0010
Chromium, T.	24009L	0.0010
Cobalt, T.	27009L	0.0010
Aluminum, Ext.	13306L	0.0200
Beryllium, Ext.	04304L	0.0010
Vanadium, T.	23009L	0.0020
Iron, Ext.	26304L	0.0020
Chemical Oxygen Demand (COD)	08304L	5.0000
Biochemical Oxygen Demand (BOD)	08202L	1.0000

TABLE 5.2 Summary of analytical methods (1982-1983)

Bacterial Analyses (1982-83 by EPS, Environment Canada)

Variable	Code
Total Coliforms	36001L - 36002L
Fecal Coliforms	36011L - 36012L
Fecal Streptococci	36102L
Standard Plate Count	36910L

Chemical Analyses (1982, AEC except where noted)

Variable	Code
Phenols *	06536L
Total Phosphorus as P **	15406L
COD *	08301L
NO_2-N *	07206L
NH_3-N *	07503L
TKN *	07001L
BOD *	08202L
BHC	18814L
Aldrin*	18130L
O,P,D, DDT*	18005L
P,P, DDT	18000L
2,4-DB	18550L
2,4-D	18500L
2,4,5-T	18510L
Dieldrin*	18150L
MCPA	18520L
Endrin*	18140L
Dursban	18210L
Heptachlor*	18040L
Hexachlorobenzene	17811L
Lindane*	18070L
Tordon	18600L
Methoxychlor*	18030L
Diazinon	18270L
Methylparathion*	18245L
Dimethoate	18340L
Heptachlor Expoxide*	18045L
Malathion	18250L
PCBs*	17801L

* City of Edmonton until 10-11 August, 1982
** Pollution Control Division, Alberta Environment

Except for the analysis for total phenolic materials, which used the 4-amino-antipyrene colorimetric method (NAQUADAT Code 06532L), the U.S. Environmental Protection Agency (EPA) analytical protocol procedures were employed in the analyses for organic compounds. Generally, qualitative screening for target compounds used relative retention times on gas chromatography (GC) and relative abundances of characteristic ions from the gas chromatography/mass spectrometry (GC/MS) data of components of the extracts. The final identifications and quantifications were accomplished by comparison with full reference spectra and/or comparison of the sample spectral response with that of an appropriate internal standard. Because the analyses of target compounds (Table 5.2) were emphasized in the study, the study results do not exclude the presence of other organic compounds not analyzed for specifically.

Analyses for organics in sediments were done by AEC; analyses for metals in sediments were performed by the Inland Waters Directorate laboratory of Environment Canada at Burlington, Ontario.

All bacterial analyses were conducted by the Environmental Protection Service, Environment Canada, Edmonton. The NAQUADAT codes for these analyses are summarized in Table 5.2.

Potamophytoplanktonic and epilithic chlorophyll-a analyses were carried out by the Pollution Control Division, Alberta Environment, Edmonton; NAQUADAT codes for these variables were 06715L and 06721L. respectively.

Laboratory methods used in the analysis of zoobenthic samples are given in Part Two of this report.

5.3 Statistical Methods

In order to conduct comparative analyses and difference testing, it was necessary to reduce the measurements for each variable to a measure of central tendency. Three statistics commonly employed for this purpose are the mean, the median, and the mode. In a perfectly normal distribution, mean, median, and mode coincide, but normal distributions are seldom encountered in water quality data sets due to the variable influences of hydrological and biological forces with time (Helsel 1983). Because concentration medians may be more representative of central tendency than the means in skewed distributions, and because several powerful, non-parametric tests can be used to test the differences between the medians of non-normal data sets (Elliott 1977), the 1982-1983 data for different sites and locations were summarized as median concentrations (i.e. 50th percentile: Zar 1974).

Most paired chemical data in this study were tested statistically using the Wilcoxon matched-pairs signed-rank test (Siegel 1956), which is a non-parametric test for the comparison of median values. The two-tailed test was used, and differences were considered significant at the 0.05 probability level. Although statistical difference testing for non-conservative constituents along a river section may not always be exhaustive, it is used in this analysis to identify the minimum level of significant spatial or temporal change.

5.4 Interpretation

To aid in interpretation, historical chemical and bacteriological data for the two regular Alberta Environment River Water Quality Monitoring Network stations at Devon and Pakan were used in some sections as an additional information source, especially for variables not investigated extensively in the course of this study.

River water quality was assessed by comparing measured values for different variables with Alberta Surface Water Quality Objectives (ASWQO), or sometimes with other objectives or guidelines when there were no ASWQO. Values higher than those stated in the ASWQO were treated as exceedences. However, two important conditions governing the application of the ASWQO should be kept in mind when assessing actual measured values: 1) the Objectives "apply to surface waters except in areas of close proximity to outfalls"; 2) the Objectives do not apply "where the natural water quality of a lake or river does not meet some of the suggested limits" (i.e. the natural levels may exceed the proposed criteria) (ASWQO, Alberta Environment 1977).

6.0 TEMPERATURE

The temperature regime in flowing surface waters is primarily dependent upon climatic and geographic conditions. Latitude, elevation, season, time and type of day, and flow velocity all affect river water temperature. Surface water temperatures are also modified by human activities; for instance, waste heat may be transferred to receiving waters from industrial discharges resulting in the elevation of water temperature above ambient levels.

Flowing waters do not usually exhibit the vertical stratification that characterizes many standing waters, although some lateral or other differences may develop due to variations in flow velocity. For example, backwaters or nearshore regions of rivers may have higher temperatures than the mainstream during the heat of summer, but will cool faster and freeze over first as winter sets in.

In this investigation, temperature was measured routinely at the same locations and sites, and on the same dates selected for sampling major chemical variables (Tables 4.3, 4.4, and 4.5), except that discrete temperature readings were made at centre-channel, left-bank and right-bank sites for the Devon and E.L. Smith locations, whereas composite samples were collected for chemical variables.

6.1 Results and Discussion - Temperature

A summary of median NSR temperatures for the 1982 and 1983 field seasons is included with the dissolved oxygen data in Figure 7.1 (Section 7.1). Within the study section of the NSR, water temperatures ranged from lows near 0.0°C in winter under ice cover to highs near 25°C in August, 1983. Longitudinal variations in water temperature at left-bank and right-bank sites for selected dates in 1982 are shown in Figure 6.1. Site-to-site variations in temperature were partly due to natural diurnal temperature progressions (sampling and temperature measurements proceeded in a downstream direction on a given day and so all temperatures were not measured simultaneously) and partly due to effluents at non-ambient temperature entering the river from tributaries, industries, or municipal facilities. Based on continuous hourly temperature data collected at Vinca in 1982 (Robot Monitor Program, Alberta Environment), water temperatures increased by as much as 1.0°C between 10.00h and 16.00h, the approximate time period over which sampling was done on a given day. Therefore, site-to-site temperature comparisons should take this possible source of variation into account.

A comparison of paired temperature data throughout the study period for Devon and Pakan shows that temperatures at Pakan averaged 0.9°C higher than temperatures at Devon (Table 6.1).

There was a consistent peak in water temperature at Clover Bar, right-bank site (Fig. 6.2). This site is located below the City of Edmonton Clover Bar Power Plant, which discharges heated condenser water into the NSR. Table 6.1 is a comparison of data from the Clover Bar right bank and Beverly Bridge centre-channel sites, the latter of which is located upstream of the power plant and is assumed to

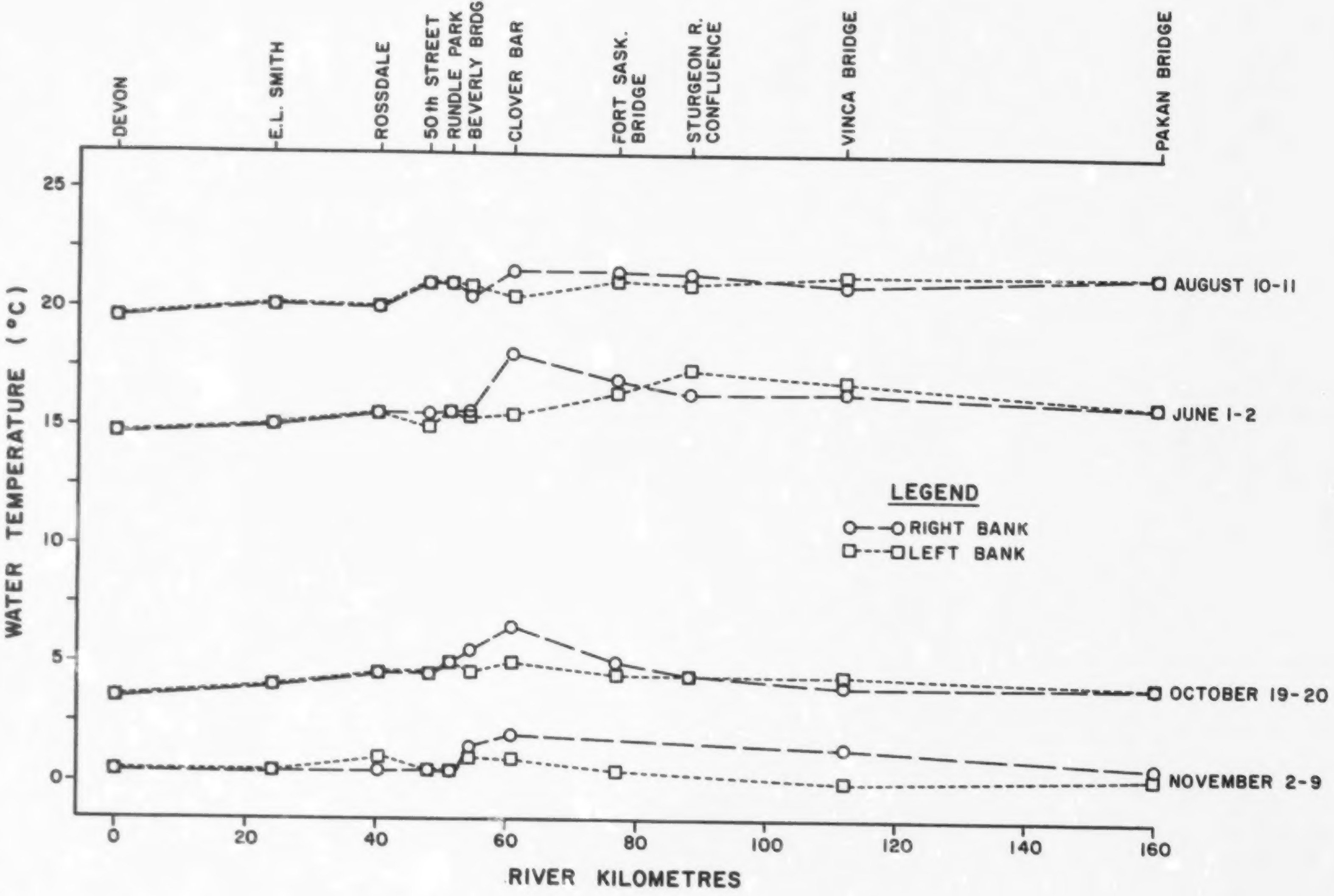


Fig. 6.1 Water temperatures at 11 locations in the North Saskatchewan River on 4 dates, 1982.

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

TABLE 6.1 Temperature summary in °C (means for left-bank, centre-channel, and right-bank sites) for the North Saskatchewan River, Devon and Pakan locations, 1982-1983.

DEVON			PAKAN			
1982 DATE	(TIME)	x	DATE	(TIME)	x	ΔT
19/05	1045	11.0	19/05	1005	--	--
01/06	1000	14.8	02/06	1220	15.9	+1.1
15/06	1100	18.3	16/06	1150	19.5	+1.2
29/06	1030	15.0	30/06	1100	16.5	+1.5
13/07	1045	17.5	14/07	1115	19.0	+1.5
27/07	1005	18.3	28/07	1120	20.0	+1.7
10/08	1030	19.5	11/08	1205	21.5	+2.0
24/08	1040	18.5	25/08	1140	17.0	(-1.5)
08/09	1015	15.5	09/09	1115	16.5	+1.0
05/10	1030	7.4	06/10	1135	7.5	+0.1
19/10	1130	3.5	20/10	1250	4.0	+0.5
02/11	1045	0.5	09/11	1135	0.4	(-0.1)
1983						
17/05	1300	9.4*	26/05	1800	15.2*	---
31/05	1215	16.8	02/06	1600	16.3	(-0.5)
14/06	1030	16.0	16/06	1145	17.2	+1.2
28/06	1000	15.5	29/06	1050	17.5	+2.0
13/07	1000	18.0	14/07	1040	19.5	+1.5
03/08	1000	22.7	04/08	1125	23.4	+0.7
23/08	1010	17.0	24/08	1130	19.5	+2.5
20/09	1030	6.5	21/09	1145	8.0	+1.5
12/10	1045	7.5	---	---	--	---
15/11	1130	1.0	16/11	1015	0.5	(-0.5)
1984						
01/02	0930	0.5	02/02	1315	0.3	(-0.2)

mean ΔT= 0.9°C

* these Devon and Pakan data not comparable because of the long delay in sampling at Pakan for this sampling event.

TABLE 6.2 Temperature summary (°C) for the North Saskatchewan River, Beverly Bridge (centre-channel site) and Clover Bar (right-bank site) locations, 1982.

Date	Beverly Bridge	Clover Bar	difference
18/05	14.0	16.0	2.0
01/06	15.5	18.1	2.6
15/06	19.5	21.5	2.0
29/06	16.0	16.5	0.5
13/07	18.0	19.0	1.0
27/07	19.0	20.0	1.0
10/08	20.5	21.5	1.0
24/08	19.0	20.5	1.5
08/09	16.0	18.5	2.5
05/10	8.1	9.4	1.3
19/10	5.0	6.5	1.5
02/11	1.0	2.0	1.0
		mean difference =	1.5°C

represent ambient temperature conditions. These two sites were sampled at nearly the same time of day; therefore, the influence of diurnal temperature variation is minimal. In 1982, the mean Clover Bar right-bank temperature was 1.5°C higher than the mean Beverly Bridge centre-channel temperature. The largest temperature difference measured between the sites was 2.6°C.

6.2 Surface Water Quality Objectives

The Alberta Surface Water Quality Objectives (Alberta Environment 1977) state that the temperature of surface waters is "not to be increased by more than 3°C above ambient water temperature" due to the addition of heated effluents from thermal plants or other industrial or municipal sources. At no time in the course of this study was this objective exceeded at any study location in the study section of the NSR.

6.3 Impacts

Beginning in 1972 and ending in 1975, a study was commissioned by Edmonton Power to determine the effects of the heated condenser water discharges from the Clover Bar generating station on the NSR. It was concluded that the thermal plume had little impact on the biological communities: "Although fish were attracted in large numbers to the thermal plume, minimal changes were observed in bacterial or invertebrate populations or in dissolved oxygen concentrations, pH, conductivity, or trace metal content of river sediments [sic]" (Edmonton Power 1975).

A possible beneficial impact of heated effluents is discussed at more length in the dissolved oxygen section of this report (Section 7.3). In short, the open water created by heated effluents in winter may enhance the reoxygenation process by exposing the water to the air.

Many physical, chemical, and biological processes in the aquatic environment are temperature sensitive. The solubility of oxygen decreases with increasing temperature, whereas the oxygen requirements of living organisms for respiration and metabolism increase as temperatures rise. Temperature affects the solubility of many elements and compounds and may affect the degree of influence certain pollutants have on aquatic life. Temperature affects growth rates, breeding, and propagation of aquatic organisms, some of which are more tolerant to unnatural variations or fluctuations than others.

7.0 DISSOLVED OXYGEN

Oxygen is one of the atmospheric gases which occurs in dissolved form in natural surface waters. It is moderately soluble in water, but saturation concentration depends upon temperature, atmospheric pressure, turbulence and salinity. For instance, the solubility of oxygen at 0°C in a given water body is approximately twice that at 35°C, where all other conditions remain constant. Actual concentrations are influenced mainly by biodepletion, by photosynthetic activity, and by re-oxygenation from the atmosphere. The bacterial decomposition of organic materials and the chemical oxidation of both organic and inorganic wastes may greatly reduce or deplete dissolved oxygen in surface waters. Inadequate dissolved oxygen concentrations may contribute to unfavorable environmental conditions for many aquatic organisms, and may be conducive to taste and odor problems resulting from anaerobic decomposition.

Dissolved oxygen was measured at the same sites and on the same dates as major chemical variables (Tables 4.4 and 4.5) with the exception that the Devon and E.L. Smith locations included discrete measurements for temperature at left-bank, centre-channel and right-bank sites. Details of methods are given in general methods (Section 5.0).

7.1 Results and Discussion: Dissolved Oxygen

The median dissolved oxygen concentrations for all left-bank and right-bank sites throughout this study are plotted in Figure 7.1; median temperatures for the same dates and sites are also shown.

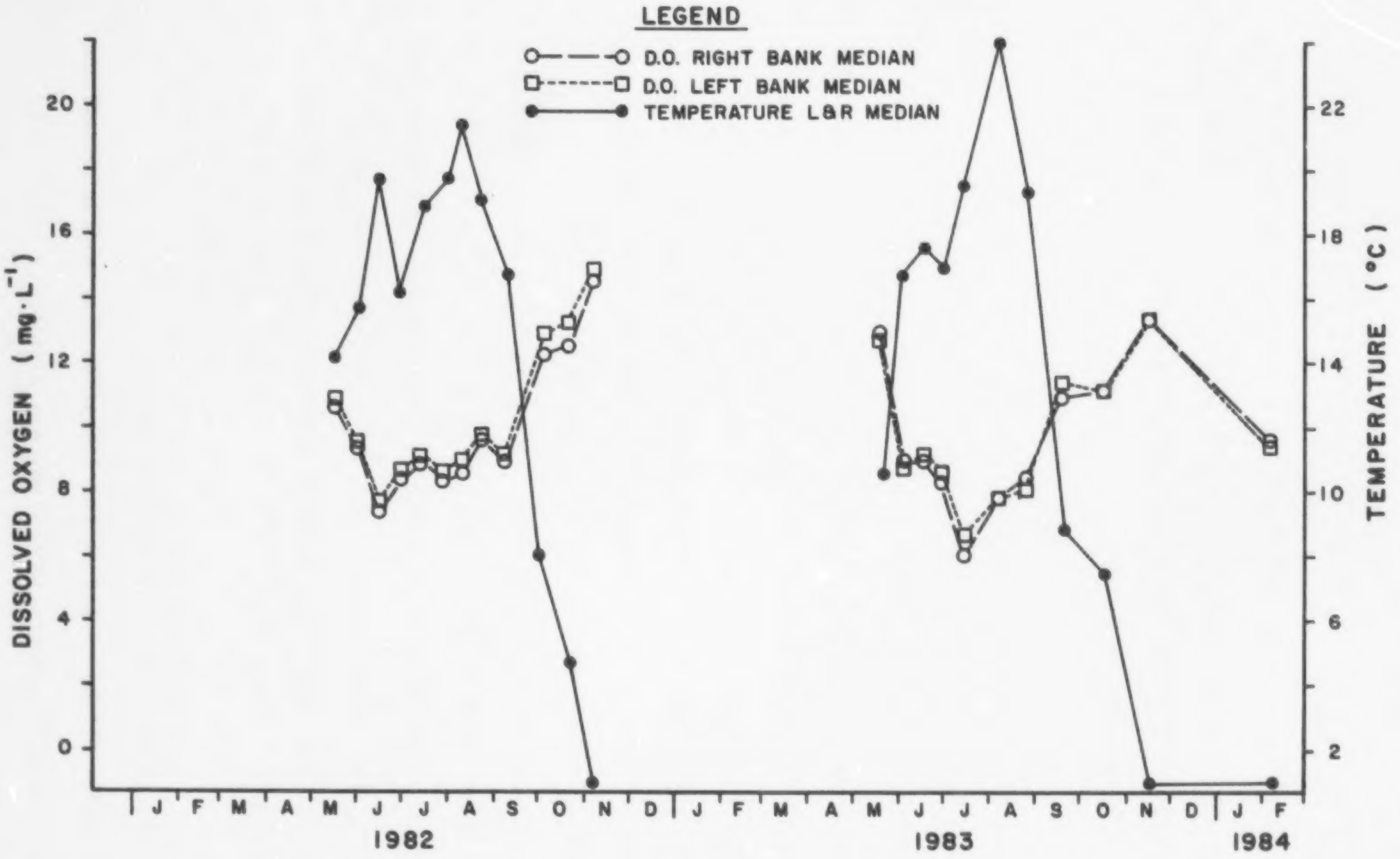


Fig. 7.1 Median dissolved oxygen and water temperature, North Saskatchewan River, 1983-1984.

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

During May 1982, dissolved oxygen concentrations in the study section of the NSR ranged from 9.5 to 11.3 mg•L^{-1}, representing 101 to 111% saturation. By mid-June 1982, all sites had seasonal lows, ranging from 6.6 to 8.5 mg•L^{-1} (80 to 95% saturation). From July onward in 1982, there was a trend towards higher dissolved oxygen concentrations, reaching 12.4 to 15.0 mg•L^{-1} (95 to 114% saturation) in November. The seasonal dissolved oxygen pattern was similar in 1983, except that seasonal lows from 5.3 to 7.2 mg•L^{-1} (63 to 85% saturation) in July were slightly lower than 1982 lows. Dissolved oxygen values in mid-winter (February 1984) had declined, ranging from 8.5 to 11.8 mg•L^{-1} (65 to 89% saturation).

A spatial overview of dissolved oxygen, expressed as percent saturation, in the study section of the NSR is given in Table 7.1.

Median dissolved oxygen values for left-bank and right-bank sites for each of the six locations sampled in both 1982 and 1983 ranged from 98% to 108% saturation. The values for all left-bank and right-bank sites were compared statistically to the corresponding upstream values at Devon. Except for the Vinca left-bank site (median = 108%), no sites were significantly different from Devon ($P<0.05$, $n = 20$).

Variations in dissolved oxygen observed on the NSR are more the result of seasonal than spatial influences. The inverse seasonal pattern of dissolved oxygen and temperature (Fig. 7.1) is characteristic of all sites. Water temperature is a primary

TABLE 7.1 Dissolved oxygen as percent saturation for selected sites on the NSR from May 1982 to February 1984

location	left bank median (range)	right bank median (range)
Devon Bridge	100 (74 - 126)	100 (75 - 125)
50th Street Footbridge	102 (65 - 125)	98 (66 - 124)
Beverly Bridge	101 (71 - 124)	100 (66 - 127)
Fort Saskatchewan	105 (71 - 129)	107 (71 - 136)
Vinca	108 (67 - 151)	98 (62 - 125)
Pakan	102 (67 - 135)	98 (65 - 135)

determinant of oxygen solubility and, therefore, an important factor governing dissolved oxygen concentrations in the river. Although concentrations vary seasonally from about 6 to 14 $mg{\cdot}L^{-1}$, this range usually represents saturation or near saturation. However, there were two exceptions to this general condition during the study period:

1) On February 28 - 29, 1984, a concentration of 9.5 $mg{\cdot}L^{-1}$ (median for all sites) represented approximately 71% saturation. A winter depression in dissolved oxygen levels in rivers and streams is a normal condition, partly because icecover prevents re-aeration, and partly because photosynthetic activity is greatly reduced at this time of year.
2) On July 13 - 14, 1983, dissolved oxygen averaged 72% saturation (Fig. 7.2). Causes of the low dissolved oxygen conditions observed are uncertain. Dissolved oxygen concentrations from the Vinca continuous monitor site (Robot Monitor Program, Alberta Environment) for July 13 - 14, 1983, ranged from 7.1 to 7.6 $mg{\cdot}L^{-1}$, representing approximately 85 to 90% saturation; this study data from Vinca on the same date gave values of 5.6 $mg{\cdot}L^{-1}$ (66% saturation). Local spatial variations or meter calibration problems were possible.

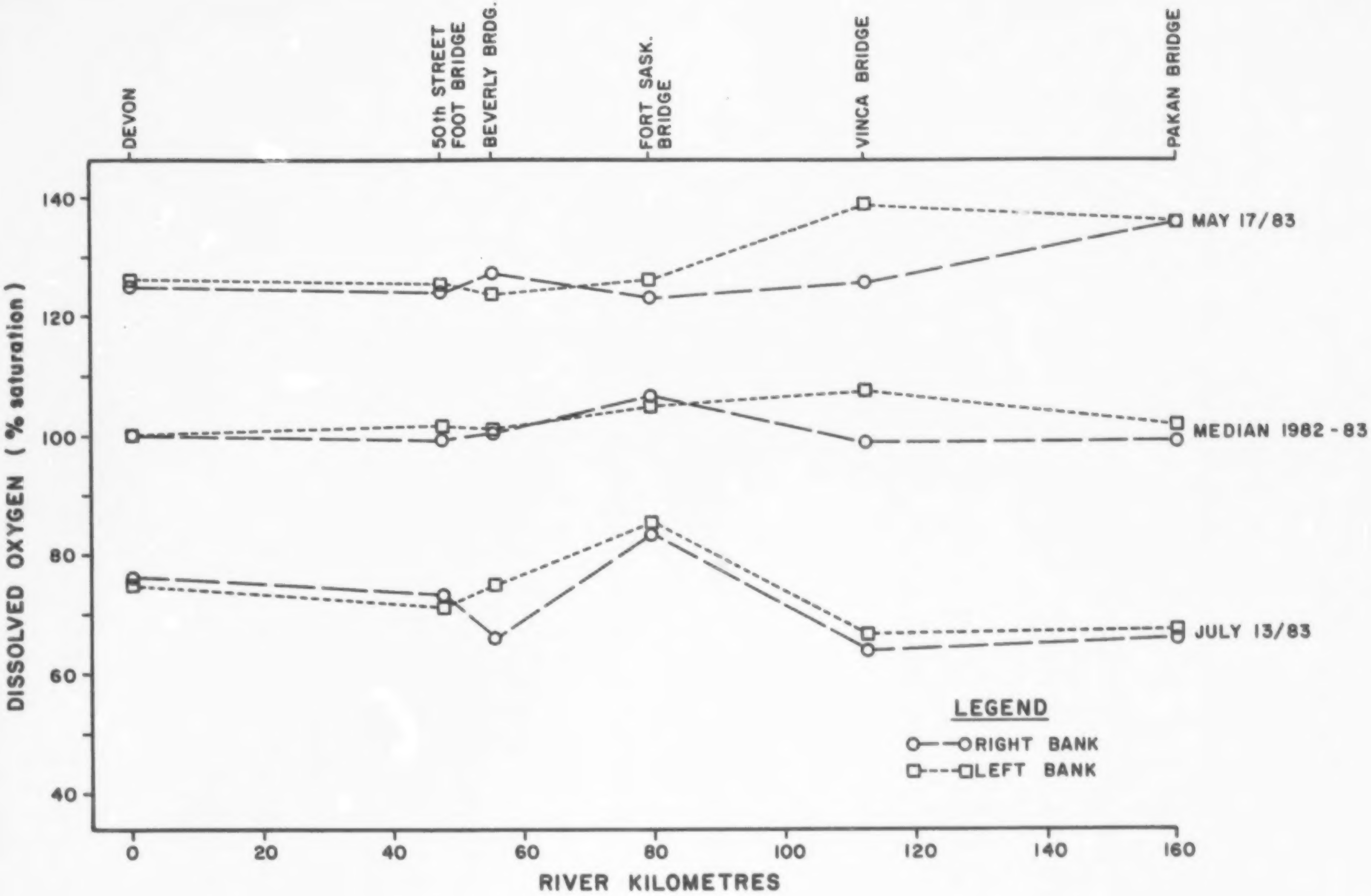


Fig. 7.2 Dissolved oxygen as percent saturation, North Saskatchewan River, 1982-1984. Median values for study period and values for selected dates are given for six sampling locations.

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

7.2 Surface Water Quality Objectives

The Alberta Surface Water Quality Objectives (Alberta Environment 1977) recommend a minimum dissolved oxygen concentration of 5 $mg{\bullet}L^{-1}$ at any time. A concentration of 5 $mg{\bullet}L^{-1}$ or more is necessary to protect fisheries and plant life, to guard against the onset of septic conditions, and to enable a waterbody to assimilate organic material adequately.

Throughout this investigation, measured dissolved oxygen values were above the 5 $mg{\bullet}L^{-1}$ objective. The lowest readings occurred on July 13 - 14, 1983, when values ranged from 5.3 to 5.8 $mg{\bullet}L^{-1}$ at both Vinca and Pakan.

Dissolved oxygen requirements and criteria specific to freshwater life have been developed by the National Research Council of Canada (Davis 1975). These criteria define three levels of harm (or risk) to various groupings of aquatic organisms based on percent saturation of dissolved oxygen over a range of water temperatures (Table 7.2). For the aquatic forms most typical of the NSR study section (freshwater mixed fish population with no salmonids), dissolved oxygen saturation above 60% provides a high degree of protection. This objective was achieved throughout the duration of the present study.

7.3 Impacts

As long as dissolved oxygen in the NSR is maintained at or above the levels found in this study (i.e. above 5 $mg{\bullet}L^{-1}$, or

TABLE 7.2 Oxygen Criteria[a] for Assessment of Harm in Various Freshwater and Marine Fish Groups (from Davis 1975).

Group	Harm Commitment Level	Percentage saturation at each temperature (°C) 0	5	10	15	20	25
Freshwater mixed fish population, including some salmonids	A	69	70	70	71	79	87
	B	54	54	54	54	57	63
	C	38	38	38	38	39	39
Freshwater mixed fish population with no salmonids	A	60	60	60	60	60	66
	B	47	47	47	47	47	48
	C	35	35	35	35	35	36
Primarily freshwater salmonid population (including steelhead)	A	76	76	76	76	85	93
	B	57	57	57	59	65	72
	C	38	38	38	42	46	51
Salmonid larvae and mature eggs of salmonids	A	98	98	98	98	100	100
	B	76	76	76	79	87	95
	C	54	54	57	64	71	78
Marine, non-anadromous species	A	88	88	95	100	100	100
	B	69	69	74	82	90	98
	C	50	51	51	55	60	65
Anadromous marine species, including salmonids	A	100	100	100	100	100	100
	B	79	79	79	79	87	94
	C	57	57	57	57	57	58

[a] These criteria are defined as oxygen minima in percentage saturation allowable at seasonal temperature maxima. Three levels of harm commitment are given (A, B and C), to allow for flexibility of application. Level A provides the highest degree of protection, level C provides the lowest.

>60% saturation, whichever is higher), few or no adverse effects can be expected from less-than-saturation dissolved oxygen levels. However, two critical periods warrant continued vigilance: the winter period and the mid-summer period.

Typically, winter oxygen levels in river waters drop because of oxygen consumption in the water and underlying sediments, combined with low levels of photosynthetic activity by plants, lower flow levels, and reduced reoxygenation from the air during the period of icecover. Winter oxygen reduction can be aggravated due to the presence of large amounts of organic matter, which can either be produced in the river itself or added via effluents entering the river. The lessening of winter oxygen depletion problems in the NSR since 1960 has been due primarily to the implementation of two measures: the enhancement of winter flows through discharge control at the Bighorn and Brazeau dams (Fig. 1.1), and the reduction in oxygen-consuming organic matter being discharged into the river in wastewater treatment plant effluents (Bouthillier 1983). By causing an extensive section of the NSR to remain open in winter, thus permitting enhanced reoxygenation to occur, a moderate amount of thermal pollution is probably also contributing to better winter oxygen conditions.

Nocturnal oxygen depletion is sometimes a problem in rivers during midsummer due to a combination of reduced photosynthetic activity during hours of darkness or low light and an increase in respiration at this time because of a greater living biomass (especially algal) which metabolizes at higher rates at warmer temperatures. Dissolved oxygen analyses were performed only during daylight hours throughout this study and, although there was no direct evidence of problems due to midsummer nocturnal oxygen depletion in 1982 or 1983, it is likely that nighttime oxygen levels were somewhat lower than daytime levels. As in the case of winter oxygen reduction, any enhanced algal growth in the future could increase the potential for midsummer nocturnal oxygen depletion.

8.0 MAJOR IONS AND RELATED VARIABLES

An analysis of longitudinal and lateral trends in the major ions and related variables for the Devon to Pakan section of the North Saskatchewan River (NSR) was made to characterize the general conditions in the river as they existed during the 1982 and 1983 field seasons (including 2 winter dates, 1984).

Two levels of analysis were undertaken: an overview analysis of trends at Devon and Pakan to identify consistent temporal and spatial changes in river chemistry, and a detailed analysis in which these changes were related to known point sources of materials (i.e. industries, municipalities, tributary streams, etc).

8.1 Results and Discussion

The median concentrations throughout the study period for the Devon location (composite sample) and the Pakan location (separate left-bank, centre-channel, and right-bank samples) are presented in Table 8.1. The study section of the NSR is alkaline freshwater (total salinity < 1000 $mg \cdot L^{-1}$; McNeely *et al*. 1979) in which calcium-bicarbonate predominates. Although the river transects the parkland biome where the northern edge of the saline lake zone occurs (Northcote and Larkin 1966), the salinity of the river water in this region increases very little, because the contribution of water and dissolved salts from these saline basins is small relative to the flow of the NSR in the central and eastern portions of Alberta. Water

TABLE 8.1 Median Concentrations of Major Ions and Related Variables in the North Saskatchewan River for the study period 1982-1983 (n = number of observations).

	Devon			Pakan		
			LB	C	RB	
Calcium (mg•L^{-1})	41	(n=24)	42	41	42	(n=23)
Magnesium (mg•L^{-1})	11.0	(n=24)	12.0	11.0	11.0	(n=12)
Sodium (mg•L^{-1})	4.0	(n=24)	8.0	7.0	7.0	(n=23)
Potassium (mg•L^{-1})	0.8	(n=24)	1.2	1.2	1.1	(n=23)
Bicarbonate (mg•L^{-1})	154	(n=22)	162	161	163	(n=21)
Chloride (mg•L^{-1})	1.0	(n=24)	3.0	2.0	2.0	(n=23)
Sulphate (mg•L^{-1})	35.0	(n=24)	40	40	40	(n=23)
Total Alk. (mg•L^{-1})	132	(n=24)	134	133	134	(n=23)
pH	8.4	(n=24)	8.0	8.2	8.1	(n=23)
TDS (mg•L^{-1})	172	(n=24)	187	182	188	(n=23)
NFR (mg•L^{-1})	11	(n=17)	12	16	13	(n=16)
Conductance (uS•cm^{-1})	317	(n=24)	352	343	349	(n=23)
Silica (mg•L^{-1})	3.9	(n=24)	3.0	3.2	3.2	(n=23)
Fluoride (mg•L^{-1})	0.13	(n=24)	0.15	0.15	0.15	(n=23)

LB = Left Bank
C = Centre
RB = Right Bank

supply and demand studies for the NSR basin have indicated that approximately 95% of the flow measured at the Saskatchewan border is derived upstream of Drayton Valley (D. Barton, Planning Division, pers. comm.).

Variations in major ion concentrations over time were similar for most variables at both the Devon and Pakan locations, although several constituents at Pakan exhibited peaks in mid May which were absent at the upstream location. In general, the maximum annual ionic concentrations, total dissolved solids (TDS), and specific conductances were observed during the summer low flow period (August), with high concentrations also observed during winter low flows. The lowest values were observed during the period of maximum annual discharge in late June and early July. The range of concentration and specific conductance changes was small compared to variations in discharge and no significant statistical correlations could be determined.

The non-filterable residue (NFR) measurement represents the solid material (approximately 1 μm or larger) that is suspended in river water and that can be removed by 0.4 μm polycarbonate membrane filtration and measured. Unlike concentrations of dissolved components, NFR concentrations and variations are frequently discharge dependent (Whitton 1975). At both Devon and Pakan, a distinct seasonality in NFR concentrations was observed. Peak concentrations occurred during the period of mountain snowmelt in late June and early July. The lowest concentrations were observed during the late summer and winter low-flow periods.

During this study, there was no change in the pattern of ionic dominance between the Devon and Pakan sampling locations; the cation sequence was $Ca^{++} > Mg^{++} > Na^{+} > K^{+}$, and the anion sequence was $HCO_3^{-} > SO_4^{=} > Cl^{-}$. This pattern is encountered frequently in the freshwater lakes of the parkland and boreal mixed wood forest biomes of central Alberta (Trew et al. 1981; Trew et al. 1985; Water Quality Control Branch 1984, 1985a, 1985b), and is the prevalent pattern of ionic dominance in North American freshwaters (Whitton 1975).

Although there was no change in the patterns of ionic dominance between Devon and Pakan, it is reasonable to expect a progressive downstream increase in the concentration of dissolved substances as a result of the natural weathering of organic and inorganic materials in the watershed, the transport of these dissolved substances via runoff into the tributaries and mainstem river (Whitton 1975), and the further concentration of these substances as a consequence of evaporation. Such increases are apparent for most of the constituents listed in Table 8.1, but the relative changes are less than 10% in most cases. The notable exceptions are the concentrations of sodium, potassium and chloride ions.

In order to determine the significance of pattern changes for these three ions, the differences were tested statistically using the Wilcoxon signed-rank matched-pairs test (see Section 5.3). In order to pair upstream and downstream data for testing, the Pakan data had to be reduced from three values per sampling trip to a single value.

Assuming that the river is well mixed at Pakan, a single value for each variable for each date was calculated for the Pakan site by calculating the mean of left-bank, centre-channel, and right-bank results. This mean value was then paired with the corresponding composite sample value from Devon and tested statistically. The upstream and downstream values during 1982-1983 were significantly different for all three variables ($P < 0.05$, $n = 21$).

In order to identify the potential sources of materials contributing to the spatial patterns, a detailed analysis of longitudinal changes in river concentrations was performed. The 1983 median values for sodium, potassium, and chloride at each location and site were tabulated along with estimated daily loadings (1983) for the industrial and municipal point sources listed in Tables 4.1 and 4.2. A further analysis of river chemistry changes and associated point source loadings was performed for a single sampling trip in 1983 (August 3-4) for which simultaneous industrial, municipal, major tributary and river data were available.

The daily loadings for each industrial or municipal point source were estimated from the product of median concentration and median discharge for each effluent determined during the 1983 sampling program. Although daily loadings are best estimated from the analysis of daily data, these data were not available for the point sources in question. However, the day-to-day variations in industrial or municipal point source loadings are small compared to natural stream loadings. The data are summarized in Tables 8.2 and 8.3.

TABLE 8.2 Estimated Industrial Daily Loadings ($kg \cdot d^{-1}$) to North Saskatchewan River.

Code	Industry	Chloride	Sodium	Potassium
I 5	Stelco	119.8	30.8	127.8
I 6	C.I.L.	3.1	0.7	3.6
I 7	Imperial Oil Refinery	1,688.4	923.0	40.0
I 9	Texaco	459.0	271.8	9.7
I 10	Gulf Refinery	349.5	236.7	5.9
I 11	Celanese South Flume	316.5	385.5	29.5
	Celanese North Flume	4.1	4.7	1.1
I 14	Alberta Food Products	8.3	12.0	1.9
I 16	Sherritt Gordon			
	Final Effluent	73.5	175.9	12.0
	South West Pond	45.3	255.2	11.7
I 17	Union Carbide	9.0	3.6	0.7
I 18	Dow Chemical	2,835.4	2,172.6	28.7
I 20	Diamond Shamrock	202.1	135.4	2.2
I 22	Esso Chemical, Redwater	44.9	314.1	27.9
	TOTAL	6,158.9	4,922.0	302.7

TABLE 8.3 Estimated Municipal Daily Loadings ($kg \cdot d^{-1}$) to North Saskatchewan River.

Code	Municipality	Chloride	Sodium	Potassium
M 3	Devon STP	65.5	103.9	14.9
M 9	GBWTP, Edmonton	12,382.0	18,937.1	2,452.1
M 10	Bremner Lagoons	1,707.6	2,323.5	476.0
M 11	St. Albert	441.6	790.2	122.0
M 13	Fort Saskatchewan	146.2	217.6	38.3
	TOTAL	14,742.9	22,372.3	3,103.3

Some samples were also collected during 1983 from the four major tributary streams to the study section (Whitemud Creek, Beaverhill Creek, Sturgeon River, Redwater River). The use of median concentration and flow data would be inappropriate for estimating daily loads in these streams because the seasonal nature of stream discharge gives highly variable values. An ideal technique for estimating daily loadings is to apply an established material flux versus discharge model for the tributary in question (Yaksich et al. 1983), but the infrequent chemical sampling of these streams precluded the use of such a regression model, even though daily discharge data were available from the Water Survey of Canada gauges on each stream. Therefore, the daily loadings for each ion from each stream have been calculated from the measurements of concentrations and discharges on specified dates in 1983; they are summarized in Table 8.4 but are not reduced to a single daily loading value for comparison with the estimated daily industrial and municipal loads. Loading data are unavailable for several smaller creeks and for all storm sewers.

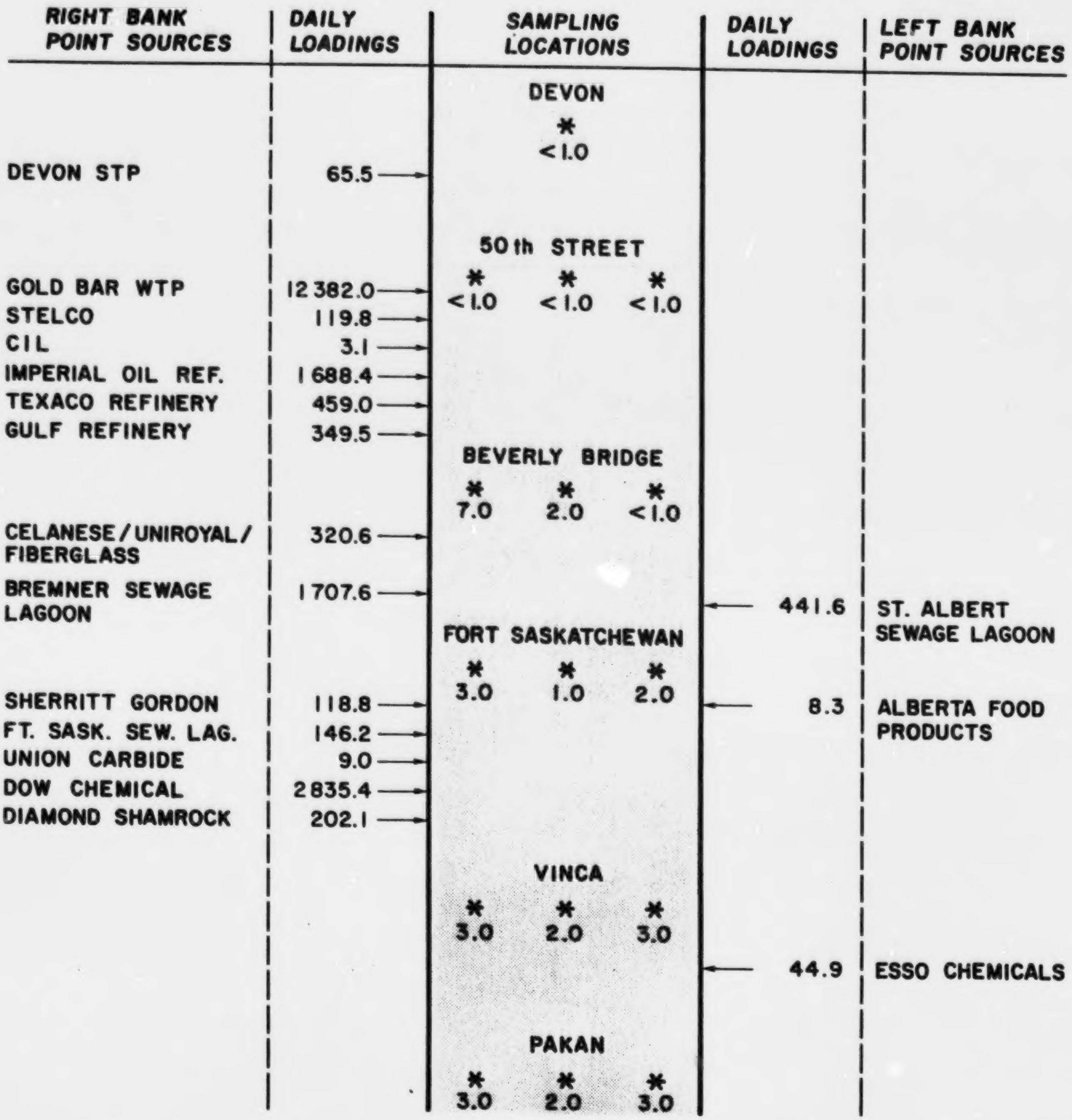
8.1.1 Chloride

The median chloride concentrations were less than the detection level of 1.0 $mg \cdot L^{-1}$ at all locations upstream of the Beverly Bridge (Figure 8.1). The daily loadings from the Devon sewage treatment plant were apparently too small to affect river chloride concentrations in this region. At the Beverly Bridge location, a

TABLE 8.4 Estimated daily loading of sodium, chloride and potassium via tributary streams to the North Saskatchewan River ($kg \cdot d^{-1}$)

	chloride	sodium	potassium
Whitemud Creek			
17/05/83	22.5	65.7	9.5
31/05/83	172.8	673.9	121.0
28/06/83	10782.7	32348.2	10513.2
13/07/83	7318.1	33454.1	12545.3
03/08/83	1010.9	4268.2	1460.2
23/08/83	21.6	95.0	13.8
20/09/83	27.6	112.3	8.6
12/10/83	63.1	241.9	20.7
Redwater River			
26/05/83	483.8	388.8	55.3
02/06/83	1002.2	812.2	112.3
16/06/83	449.3	518.4	69.1
29/06/83	9322.6	21513.6	4155.8
14/07/83	1969.9	6894.7	2168.6
04/08/83	829.4	1866.2	388.8
24/08/83	146.9	181.4	24.2
21/09/83	596.2	440.6	36.3
Beaverhill Creek			
29/06/83	3525.1	30551.0	6696.0
14/07/83	829.4	8017.9	1987.2
04/08/83	216.0	1382.4	354.2
24/08/83	9.5	34.6	8.6
21/09/83	3.1	6.7	1.0
Sturgeon River			
26/05/83	1036.8	7465.0	1702.1
02/06/83	967.7	5253.1	1149.1
16/06/83	760.3	3732.5	509.8
29/06/83	7439.0	36132.5	6480.0
14/07/83	3767.0	29194.6	7249.0
04/08/83	2592.0	15984.0	3542.4
24/08/83	881.3	6169.0	1192.3
21/09/83	388.3	2116.8	345.6

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch


RIGHT BANK POINT SOURCES
DAILY LOADINGS
SAMPLING LOCATIONS
DAILY LOADINGS
LEFT BANK POINT SOURCES
DEVON
*
<1.0
DEVON STP
65.5
50th STREET
* * *
<1.0 <1.0 <1.0
GOLD BAR WTP
12 382.0
STELCO
119.8
CIL
3.1
IMPERIAL OIL REF.
1 688.4
TEXACO REFINERY
459.0
GULF REFINERY
349.5
BEVERLY BRIDGE
* * *
7.0 2.0 <1.0
CELANESE/UNIROYAL/FIBERGLASS
320.6
BREMNER SEWAGE LAGOON
1 707.6
441.6
ST. ALBERT SEWAGE LAGOON
FORT SASKATCHEWAN
* * *
3.0 1.0 2.0
SHERRITT GORDON
118.8
8.3
ALBERTA FOOD PRODUCTS
FT. SASK. SEW. LAG.
146.2
UNION CARBIDE
9.0
DOW CHEMICAL
2 835.4
DIAMOND SHAMROCK
202.1
VINCA
* * *
3.0 2.0 3.0
44.9
ESSO CHEMICALS
PAKAN
* * *
3.0 2.0 3.0

TOTAL INDUSTRIAL LOAD = 6 158.9

TOTAL MUNICIPAL LOAD = 14 742.9

TOTAL DAILY LOAD = 20 901.8

Fig. 8.1 Diagrammatic representation of 1983-84 median chloride concentrations ($mg \cdot L^{-1}$) and estimated municipal and industrial point source loadings ($kg \cdot d^{-1}$) .

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

relatively high median concentration of 7.0 $mg{\bullet}L^{-1}$ characterized the right-bank site, whereas the left-bank median remained less than the detection level. This concentration change was clearly associated with the seven point sources illustrated in Figure 8.1.

The median concentrations at Fort Saskatchewan Bridge, Vinca Bridge and Pakan Bridge revealed similar spatial characteristics with the centre-channel site always having the lowest concentrations. Median chloride concentrations at left-bank and centre-channel sites were above the detection limit at the Fort Saskatchewan Bridge location, but it is not possible to ascertain whether this is due to lateral mixing of the right-bank chloride loadings, or a combination of mixing and left-bank loading from the St. Albert sewage treatment plant outfall. A detailed study of the mixing regime of the NSR in the vicinity of these effluents would be required in order to resolve this issue.

A wide range of continuous point source loadings of chloride was suggested by the loading analysis. The daily loads range from 8.3 $kg{\bullet}d^{-1}$ to 12382.0 $kg{\bullet}d^{-1}$; the latter source was the City of Edmonton's Gold Bar Wastewater Treatment Plant (GBWTP) which contributed over half the continuous daily load of 20,901.8 $kg{\bullet}d^{-1}$ as estimated by this technique. As a group, the municipal discharges contributed approximately 70.5% of the combined industrial and municipal loads; most of the point-source chloride loading enters the river on the right bank between GBWTP and the mouth of the Sturgeon River.

Because chloride is usually considered a conservative constituent (Wetzel 1975), a simple dilution analysis can be used to compare daily point source loading estimates with the difference between daily river loads upstream and downstream of the City of Edmonton. The results from sampling trips closest to dates when discharges approximated mean annual discharges for each of the 1982 and 1983 study years were used in the comparisons. For October 5-6, 1982, the daily river chloride loads at Devon and Pakan were estimated to be 18403 and 36806 $kg \cdot d^{-1}$, respectively - a downstream increase of 18403 $kg \cdot d^{-1}$. For August 23-24, 1983, the daily loads at Devon and Pakan were estimated at 13910 and 27820 $kg \cdot d^{-1}$, respectively - a downstream increase of 13910 $kg \cdot d^{-1}$. Because the concentrations at Devon on both trips were below the detection limit and were assumed to be 1.0 $mg \cdot L^{-1}$ for calculation purposes, these loadings may be slightly underestimated. However, they tally well with the point-source estimates, especially in consideration of the small data base and the technique employed in the calculation of point-source loads.

The river chloride concentrations and detailed point-source loadings measured during August 3-4, 1983 are illustrated in Figure 8.2. The general pattern of concentration changes was similar to that portrayed by the median concentration data. Concentrations were below detection at the Devon and 50th Street Footbridge locations, but rose sharply at the Beverly Bridge right-bank site. At the Fort Saskatchewan Bridge, all samples were above detection, but again right-

RIGHT BANK POINT SOURCES	DAILY LOADINGS	SAMPLING LOCATIONS	DAILY LOADINGS	LEFT BANK POINT SOURCES
		DEVON * <1.0		
DEVON STP	67.1 →			
WHITEMUD CREEK	1010.9 →			
		50th STREET * <1.0 * <1.0 * <1.0		
GOLD BAR WTP	12408.0 →			
STELCO	127.3 →			
CIL	3.2 →			
IMPERIAL OIL REF.	1090.1 →			
TEXACO REFINERY	400.8 →			
GULF REFINERY	253.5 →			
		BEVERLY BRIDGE * 4.0 * 2.0 * <1.0		
CELANESE / UNIROYAL / FIBERGLASS	567.5 →			
BREMNER SEWAGE LAGOON	7012.2 →			
			← 399.5	ST. ALBERT SEWAGE LAGOON
		FORT SASKATCHEWAN * 5.0 * 3.0 * 3.0		
SHERRITT GORDON	133.1 →		← 3.7	ALBERTA FOOD PRODUCTS
FT. SASK. SEW. LAG.	229.5 →			
UNION CARBIDE	11.1 →			
DOW CHEMICAL	2845.8 →		← 2592.0	STURGEON RIVER
DIAMOND SHAMROCK	185.0 →			
BEAVERHILL CREEK	216.0 →			
			← 829.4	REDWATER RIVER
		VINCA * 5.0 * 5.0 * 5.0		
			← 116.9	ESSO CHEMICALS
		PAKAN * 4.0 * 4.0 * 4.0		

TOTAL TRIBUTARY LOAD = 4648.3
TOTAL INDUSTRIAL LOAD = 5738.0
TOTAL MUNICIPAL LOAD = 20116.3

TOTAL DAILY LOAD = 30502.6

Fig. 8.2 Diagrammatic representation of Aug. 3-4/83 chloride concentrations (mg · L⁻¹) and estimated municipal, tributary and industrial point source loadings (kg · d⁻¹).

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

bank concentrations were higher. At Vinca Bridge and Pakan bridge concentrations were uniform across the river.

The breakdown in measured daily loadings during August 3-4, 1983, was as follows:

Industrial	5,834.4 $kg \cdot d^{-1}$
Municipal	20,020.0 $kg \cdot d^{-1}$
Tributaries	4,648.3 $kg \cdot d^{-1}$
Total	30,502.7 $kg \cdot d^{-1}$

Once again, the municipal discharges were the largest source of chloride loads, representing approximately 65.6% of the total input. The total change in chloride mass between Devon and Pakan was also determined from flow and concentration data to be approximately 37,324.8 $kg \cdot d^{-1}$, which corresponds reasonably well with the total measured inputs. However, the reader is cautioned that storm sewers and small tributaries were not measured, and that the precise mass at Devon could not be determined because the river chloride concentration was below the analytical detection limit.

The great influence of the rate of river discharge on chloride concentrations is apparent upon the examination of the more detailed chloride data from high-flow and low-flow periods in 1982. The mean daily discharge for the North Saskatchewan River at Edmonton during 1982 was 218 $m^3 \cdot s^{-1}$ (Water Survey of Canada, Station 05DF001). Thus, the discharge rate at this station during sampling trips on July 27, 1982 ($Q = 393\ m^3 \cdot s^{-1}$) and August 24, 1982 ($Q = 118\ m^3 \cdot s^{-1}$) are representative of relatively high and low flows.

On July 27, 1982, chloride concentrations of 2.0 $mg \cdot L^{-1}$ in right-bank samples from the Beverly Bridge and Pakan locations, and both right-bank and left-bank samples from Vinca were the only ones observed above the analytical detection limit (Table 8.5). All other sites upstream and downstream of Edmonton yielded chloride concentrations less than 1.0 $mg \cdot L^{-1}$. This pattern is quite different from that for 1983 median chloride concentrations (Figure 8.1) and implies that dilution, turbulence and mixing were sufficient to mask the continuous point-source inputs of chloride.

In contrast, the 1982 data for August 24 during low flow showed a longitudinal pattern (Table 8.6) similar to that for 1983 median concentrations. Chloride concentrations were below the analytical detection limit upstream of the main point sources, but were generally as high as the 1983 median values at the Beverly Bridge right-bank site and downstream. At this time, mixing and dilution were insufficient to mask point-source chloride inputs. These few data indicate that mixing in the North Saskatchewan River is not constant in time or space and can be expected to vary greatly with the discharge rate.

8.1.2 Sodium

The longitudinal patterns for 1983 median sodium concentrations were similar to those for chloride (Figure 8.3). Upstream concentrations ranged from 4.0 to 6.0 $mg \cdot L^{-1}$. The first major increase in median concentration was at the Beverly Bridge right-bank

TABLE 8.5 North Saskatchewan River Chloride Concentrations ($mg \cdot L^{-1}$) on July 27, 1982 (High Flow - 393 $m^3 \cdot s^{-1}$)

Sampling Locations	Right	Centre	Left
Devon		<1.0	
E.L. Smith		<1.0	
Rossdale	<1.0	<1.0	<1.0
50th Street Footbridge	<1.0	<1.0	<1.0
Rundle Bridge	<1.0	<1.0	<1.0
Beverly Bridge	2.0	<1.0	<1.0
Clover Bar	<1.0	<1.0	<1.0
Fort Saskatchewan Bridge	<1.0	<1.0	<1.0
Sturgeon River	<1.0	<1.0	<1.0
Vinca Bridge	2.0	<1.0	2.0
Pakan Bridge	2.0	<1.0	<1.0

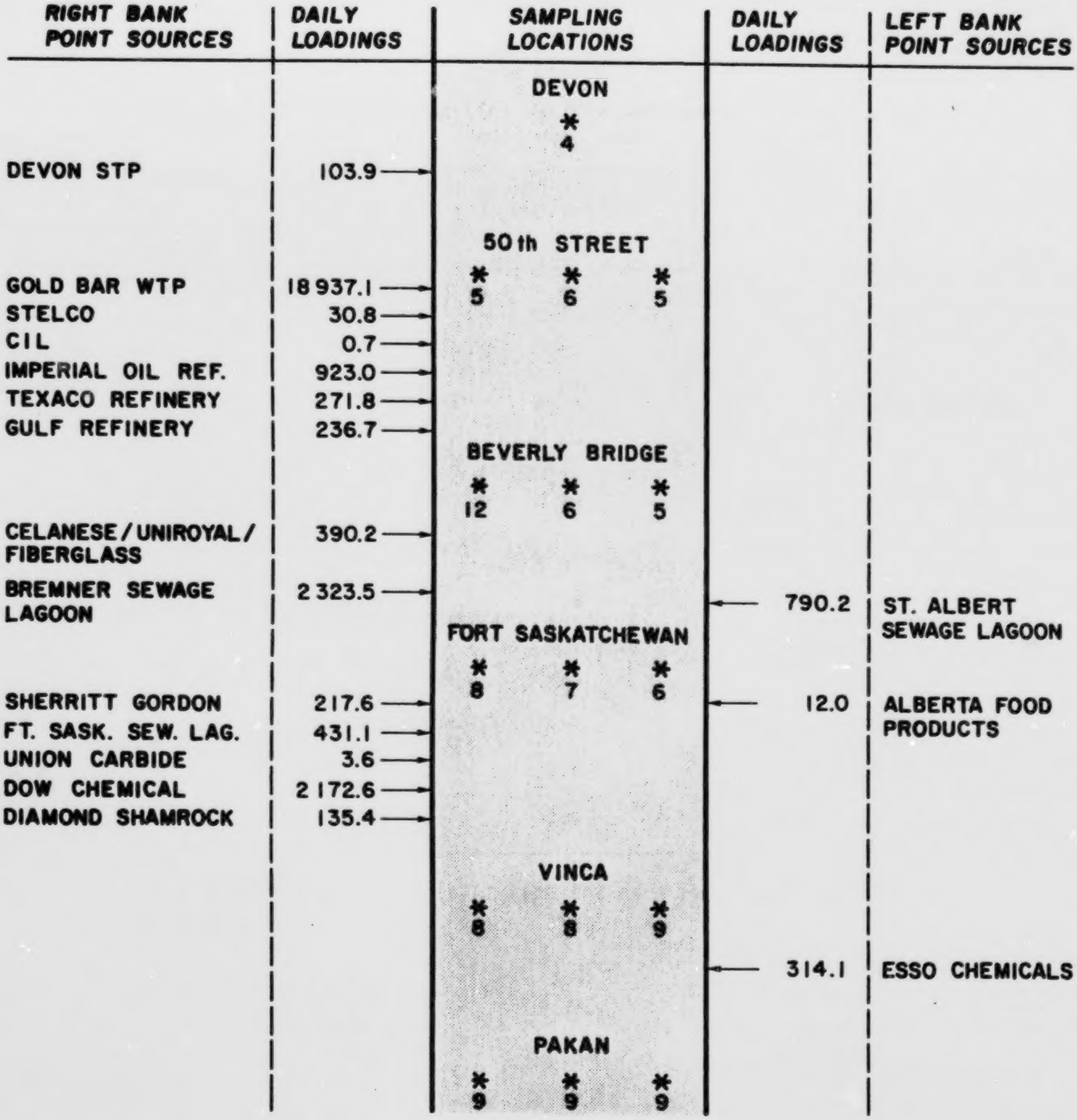
< indicates value less than the analytical detection limit

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

TABLE 8.6 North Saskatchewan River chloride concentrations ($mg \cdot L^{-1}$) on August 24, 1982 (low flow - 118 $m^3 \cdot s^{-1}$)

Sampling Locations	Right	Centre	Left
Devon		<1.0	
E.L. Smith		<1.0	
Rossdale	<1.0	<1.0	<1.0
50th Street Footbridge	<1.0	<1.0	<1.0
Rundle Bridge	<1.0	<1.0	<1.0
Beverly Bridge	4.0	<1.0	<1.0
Clover Bar	3.0	<1.0	<1.0
Fort Saskatchewan Bridge	4.0	2.0	2.0
Sturgeon River	8.0	3.0	3.0
Vinca Bridge	4.0	3.0	3.0
Pakan Bridge	2.0	3.0	3.0

< indicates value less than the analytical detection limit


RIGHT BANK POINT SOURCES
DAILY LOADINGS
SAMPLING LOCATIONS
DAILY LOADINGS
LEFT BANK POINT SOURCES
DEVON
* 4
DEVON STP 103.9
50th STREET
* 5 * 6 * 5
GOLD BAR WTP 18 937.1
STELCO 30.8
CIL 0.7
IMPERIAL OIL REF. 923.0
TEXACO REFINERY 271.8
GULF REFINERY 236.7
BEVERLY BRIDGE
* 12 * 6 * 5
CELANESE / UNIROYAL / FIBERGLASS 390.2
BREMNER SEWAGE LAGOON 2 323.5
790.2 ST. ALBERT SEWAGE LAGOON
FORT SASKATCHEWAN
* 8 * 7 * 6
SHERRITT GORDON 217.6
12.0 ALBERTA FOOD PRODUCTS
FT. SASK. SEW. LAG. 431.1
UNION CARBIDE 3.6
DOW CHEMICAL 2 172.6
DIAMOND SHAMROCK 135.4
VINCA
* 8 * 8 * 9
314.1 ESSO CHEMICALS
PAKAN
* 9 * 9 * 9

TOTAL INDUSTRIAL LOAD = 4 922.0
TOTAL MUNICIPAL LOAD = 22 372.3

TOTAL DAILY LOAD = 27 294.3

Fig. 8.3 Diagrammatic representation of 1983-84 median sodium concentrations ($mg \cdot L^{-1}$) and estimated municipal and industrial point source loadings ($kg \cdot d^{-1}$) .

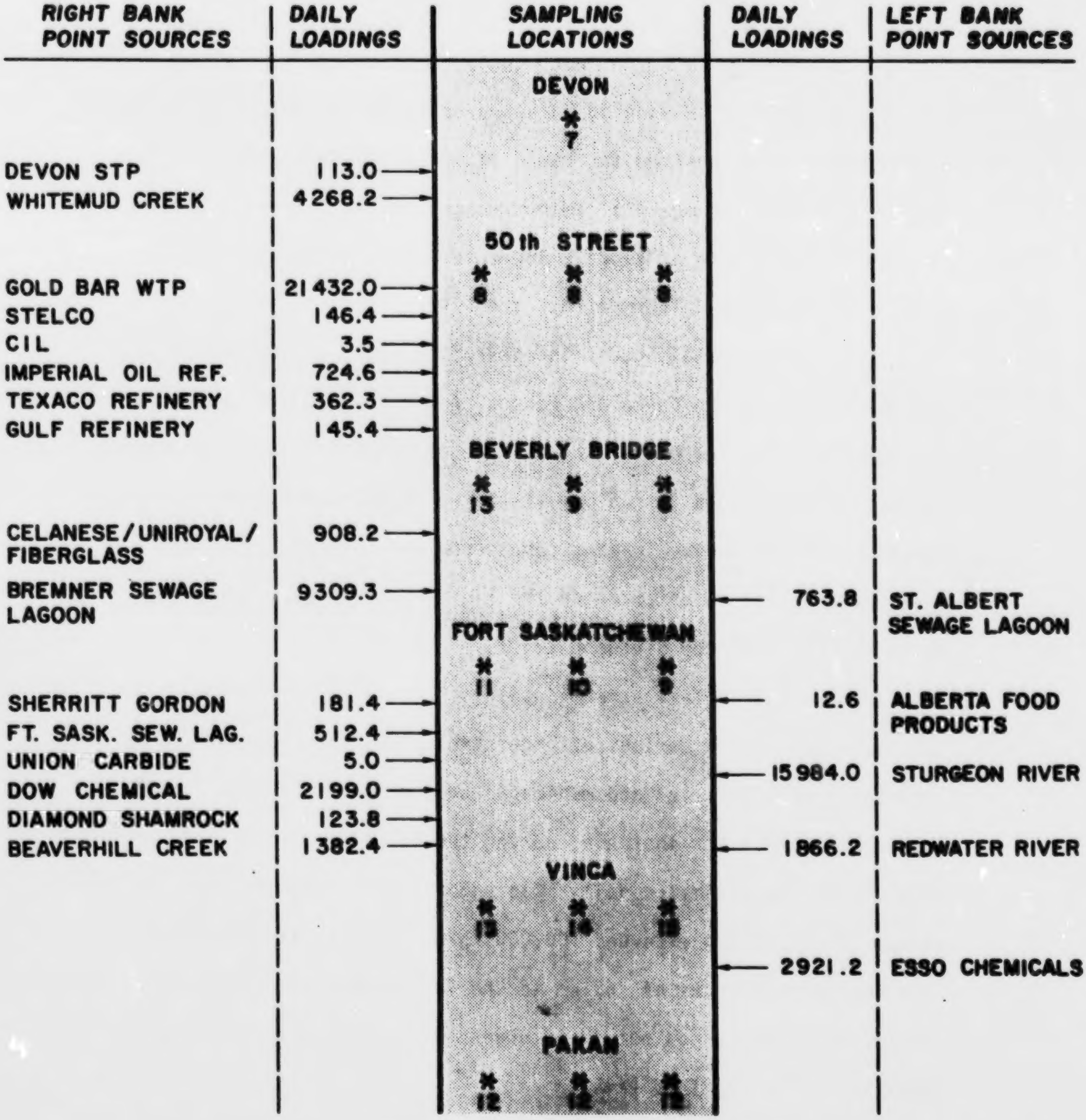
Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

site (12.0 mg•L^{-1}). Mixing again appeared to be incomplete at Fort Saskatchewan, judging from the range of median concentrations at this location (6.0 to 8.0 mg•L^{-1}). Minor concentration increases occurred at the left-bank site at Vinca Bridge, but at Pakan Bridge concentrations were uniform across the river.

These median data suggest the nearly doubling of sodium concentration between Devon and Pakan. As in the case of chloride, the major portion (82.0%) of the average daily continuous point-source loading (27294.3 kg•d^{-1}) can be attributed to the GBWTP. Most of the remainder of the sodium loading comes from various industrial and municipal discharges entering on the right bank of the river between GBWTP and the mouth of Sturgeon River.

The daily tributary stream loadings calculated for sodium indicate that during periods of high streamflow, the relative importance of industrial and municipal sodium sources to the total load diminishes. For instance, during the sampling period of 28-29 June, 1983, the estimated daily loading of sodium from the four streams in Table 8.4 exceeded 100,000 kg•d^{-1}. Most streams became less important sources of sodium in the late summer and autumn as streamflows diminished, but the Sturgeon River remained a significant point source during this time.

The detailed sodium concentration and loading data for August 3-4, 1983, are presented in Figure 8.4. The data reveal a concentration increase of 5 mg•L^{-1} between Devon and Pakan, equivalent


RIGHT BANK POINT SOURCES
DAILY LOADINGS
SAMPLING LOCATIONS
DAILY LOADINGS
LEFT BANK POINT SOURCES
DEVON
*
7
DEVON STP
113.0
WHITEMUD CREEK
4268.2
50th STREET
*
8
*
8
*
8
GOLD BAR WTP
21432.0
STELCO
146.4
CIL
3.5
IMPERIAL OIL REF.
724.6
TEXACO REFINERY
362.3
GULF REFINERY
145.4
BEVERLY BRIDGE
*
13
*
9
*
6
CELANESE/UNIROYAL/FIBERGLASS
908.2
BREMNER SEWAGE LAGOON
9309.3
763.8
ST. ALBERT SEWAGE LAGOON
FORT SASKATCHEWAN
*
11
*
10
*
9
SHERRITT GORDON
181.4
12.6
ALBERTA FOOD PRODUCTS
FT. SASK. SEW. LAG.
512.4
UNION CARBIDE
5.0
15984.0
STURGEON RIVER
DOW CHEMICAL
2199.0
DIAMOND SHAMROCK
123.8
BEAVERHILL CREEK
1382.4
1866.2
REDWATER RIVER
VINCA
*
13
*
14
*
13
2921.2
ESSO CHEMICALS
PAKAN
*
12
*
12
*
12

TOTAL TRIBUTARY LOAD = 23 500.8
TOTAL INDUSTRIAL LOAD = 6 678.4
TOTAL MUNICIPAL LOAD = 32 130.5

TOTAL DAILY LOAD = 62 309.7

Fig. 8.4 Diagrammatic representation of Aug. 3-4/83 sodium concentrations ($mg \cdot L^{-1}$) and estimated municipal, tributary and industrial point source loadings ($kg \cdot d^{-1}$).

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

to a mass increase of approximately 60,912 kg. The breakdown of measured industrial, municipal, and tributary loads for these dates is as follows:

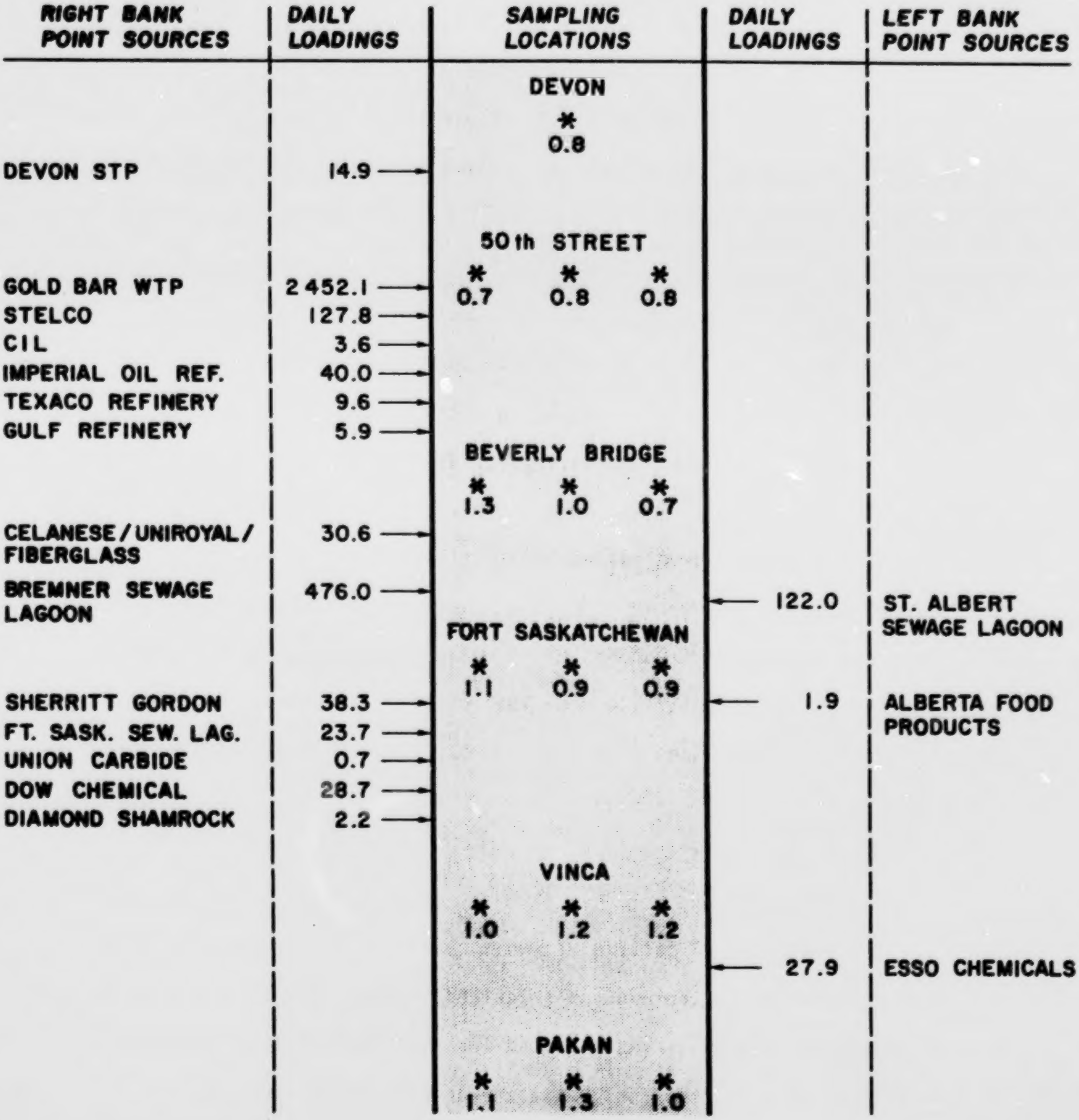
Industrial	8,063.4	kg·d^{-1}
Municipal	31,799.5	kg·d^{-1}
Tributaries	23,500.8	kg·d^{-1}
Total	63,363.7	kg·d^{-1}

Thus, the total measured sodium input for these dates closely approximated the change in river sodium mass. The importance of municipal wastewater treatment plant sodium discharges was relatively less (52.2%) than comparable municipal chloride discharges because of the high sodium loadings from tributaries, particularly the Sturgeon River.

8.1.3 Potassium

The longitudinal pattern of median potassium concentrations (Fig. 8.5) was similar to those of chloride and sodium. The first elevation in median concentration was detected for right-bank samples at the Beverly Bridge. At the Fort Saskatchewan Bridge and locations downstream, concentrations were greater than those upstream, but transverse variability was indicated by the data.

The average daily loading of potassium for the various continuous point sources has been estimated at 3405.9 kg·d^{-1}, which is a much smaller mass loading to the river than was the case for either


RIGHT BANK POINT SOURCES
DAILY LOADINGS
SAMPLING LOCATIONS
DAILY LOADINGS
LEFT BANK POINT SOURCES
DEVON
* 0.8
DEVON STP
14.9
50th STREET
* 0.7
* 0.8
* 0.8
GOLD BAR WTP
2 452.1
STELCO
127.8
CIL
3.6
IMPERIAL OIL REF.
40.0
TEXACO REFINERY
9.6
GULF REFINERY
5.9
BEVERLY BRIDGE
* 1.3
* 1.0
* 0.7
CELANESE / UNIROYAL / FIBERGLASS
30.6
BREMNER SEWAGE LAGOON
476.0
122.0
ST. ALBERT SEWAGE LAGOON
FORT SASKATCHEWAN
* 1.1
* 0.9
* 0.9
SHERRITT GORDON
38.3
1.9
ALBERTA FOOD PRODUCTS
FT. SASK. SEW. LAG.
23.7
UNION CARBIDE
0.7
DOW CHEMICAL
28.7
DIAMOND SHAMROCK
2.2
VINCA
* 1.0
* 1.2
* 1.2
27.9
ESSO CHEMICALS
PAKAN
* 1.1
* 1.3
* 1.0

TOTAL INDUSTRIAL LOAD	=	302.7
TOTAL MUNICIPAL LOAD	=	3 103.2
TOTAL DAILY LOAD	=	3 405.9

Fig. 8.5 Diagrammatic representation of 1983-84 median potassium concentrations (mg·L^{-1}) and estimated municipal and industrial point source loadings (kg·d^{-1}) .

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

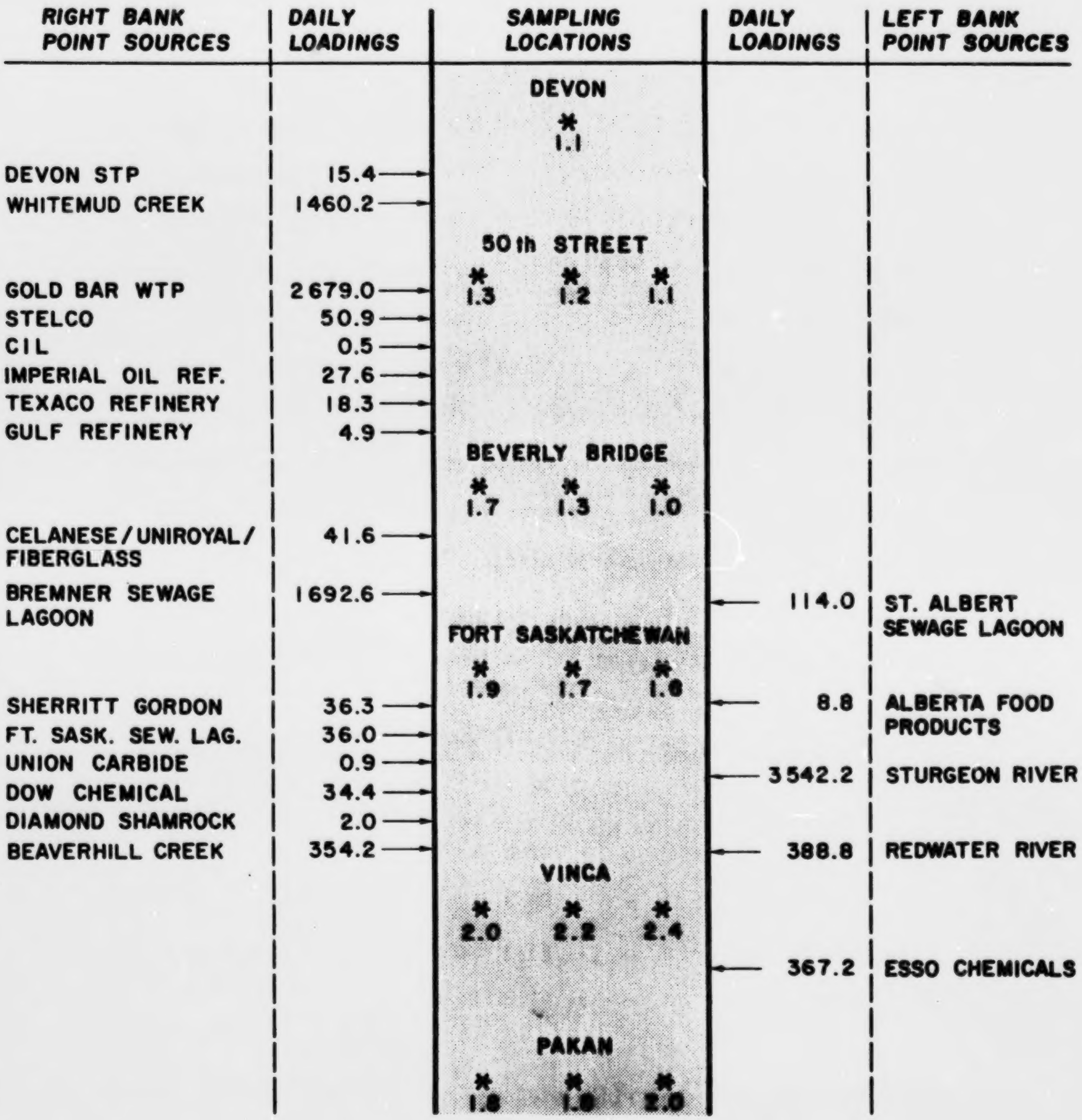
sodium or chloride (see Tables 8.2 and 8.3). Of this amount, the GBWTP contributed approximately 72.0%. In comparison to these estimates of daily municipal and industrial loadings, the Sturgeon River and the other three tributaries contributed relatively large amounts on those dates for which data were available (Table 8.4).

The detailed potassium concentration and loading data for August 3-4, 1983 are presented in Figure 8.6. The concentration pattern was similar to that portrayed by the median data in all but one important aspect. Although the first elevation in concentration was detected in the right-bank sample at Beverly Bridge, the highest overall concentration was detected at the left-bank sample from Vinca Bridge. These concentration data suggested an important left-bank source of potassium.

The breakdown of measured potassium loadings was as follows:

Industrial	302.6	$kg \cdot d^{-1}$
Municipal	3,103.3	$kg \cdot d^{-1}$
Tributaries	5,745.3	$kg \cdot d^{-1}$
Total	9,151.3	$kg \cdot d^{-1}$

Unlike the sodium and chloride loadings, most of the potassium loading on August 3-4, 1983 was derived from tributaries (62.8%), particularly from the Sturgeon River, which apparently determined the left-bank concentration at Vinca Bridge.


RIGHT BANK POINT SOURCES
DAILY LOADINGS
SAMPLING LOCATIONS
DAILY LOADINGS
LEFT BANK POINT SOURCES
DEVON
* 1.1
DEVON STP
15.4
WHITEMUD CREEK
1460.2
50th STREET
* 1.3
* 1.2
* 1.1
GOLD BAR WTP
2679.0
STELCO
50.9
CIL
0.5
IMPERIAL OIL REF.
27.6
TEXACO REFINERY
18.3
GULF REFINERY
4.9
BEVERLY BRIDGE
* 1.7
* 1.3
* 1.0
CELANESE/UNIROYAL/FIBERGLASS
41.6
BREMNER SEWAGE LAGOON
1692.6
114.0
ST. ALBERT SEWAGE LAGOON
FORT SASKATCHEWAN
* 1.9
* 1.7
* 1.8
SHERRITT GORDON
36.3
8.8
ALBERTA FOOD PRODUCTS
FT. SASK. SEW. LAG.
36.0
UNION CARBIDE
0.9
3542.2
STURGEON RIVER
DOW CHEMICAL
34.4
DIAMOND SHAMROCK
2.0
BEAVERHILL CREEK
354.2
388.8
REDWATER RIVER
VINCA
* 2.0
* 2.2
* 2.4
367.2
ESSO CHEMICALS
PAKAN
* 1.8
* 1.8
* 2.0

TOTAL TRIBUTARY LOAD = 5745.4
TOTAL INDUSTRIAL LOAD = 593.4
TOTAL MUNICIPAL LOAD = 4537.0

TOTAL DAILY LOAD = 10875.8

Fig. 8.6 Diagrammatic representation of Aug. 3-4/83 potassium concentrations ($mg \cdot L^{-1}$) and estimated municipal, tributary and industrial point source loadings ($kg \cdot d^{-1}$).

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

8.1.4 Storm Sewers and Snow Dumps

In concluding the results and discussion component of this section, it is appropriate to address briefly a number of important but transient sources of sodium, chloride, and potassium not previously quantified. These sources are the storm sewers (see Section 2.9) and the winter snow dumps, six of which have been located adjacent to or on the river (Fig. 2.5).

A preliminary investigation of storm-sewer runoff characteristics was conducted during March and April, 1982, in order to determine the influence of local spring runoff on river water quality (Reynoldson and Livingstone 1983). An analysis of diurnal loading patterns for sodium and chloride was performed and revealed that large daily inputs from the storm sewers upstream of the Rossdale Water Treatment Plant occurred. Estimated daily inputs for sodium and chloride on March 24, 1982, were 24998 kg and 37503 kg, respectively. A distinct seasonality in daily loading rates was evident also, with the highest inputs occurring during the period of maximum local snowmelt (late March) and subsiding thereafter.

Reports submitted to Alberta Environment as stipulated in the City's license to maintain snow dumps (City of Edmonton 1982, 1983) have been reviewed for the time period encompassed by the present study (i.e. winters of 1981-82 and 1982-83). These winters were vastly different in terms of snowfall: 1981-82 was a winter of extremely heavy snowfall; 1982-83 was a winter of such low snowfall accumulation that only one river dump was used. Typically, year-to-year variability characterizes these sources.

The 1981-82 data have revealed that masses of road salt and other materials were concentrated in the snow dump located at the Groat Road Bridge. In terms of the three major ions of interest, the estimated quantities were: chloride (72,912 kg), sodium (55,986 kg), potassium (3,949 kg). These estimates were based on the approximate volume of water stored in the dump and the results of replicated chemical sampling and analysis (City of Edmonton 1982). Thus, a considerable mass of materials was released to the river from this dump alone in 1981-82. However, the timing of the release coincided with high dilution capacity (median flow greater than 200 $m^3 \cdot s^{-1}$) resulting from local spring runoff. Previous studies (Renewable Resources 1974) have suggested that the bulk of the snow dump masses may disappear over a period of several days during the time of spring thaw and river ice break-up from mid April to late April.

Because the data collection program of the present river water quality study did not commence until May 18, 1982, the data set did not permit the examination of the influence of either spring storm-water runoff or snow dumps on river water quality. Because of the episodic nature of these inputs, a specially designed sampling program would be needed in order to evaluate river water quality during this short but critical period.

8.2 Surface Water Quality Objectives

Provincial objectives have not been specified for the major ions discussed in the preceding section. This is because they are often too variable in the natural state to permit the definition of absolute limits and because most are considered harmless even when present in moderately high concentrations (McNeely et al. 1979).

An objective of 10 $mg \cdot L^{-1}$ over background concentration has been set for suspended solids, or NFR. However, this objective is difficult to apply in any developed river basin since true background data (i.e. pre-settlement data) are usually unavailable. The only alternative is to make upstream-downstream comparisons on the assumption that the upstream data would be representative of pre-settlement conditions further downstream.

Based on this approach, comparisons were made between the NFR data sets at Devon and the other sampling locations for each sampling trip in 1982 and 1983. In sixty-three of 280 individual samples, downstream concentrations exceeded background concentrations by more than 10 $mg \cdot L^{-1}$, usually during high-flow events associated with rainfall or mountain snowmelt between mid-May and mid-July. Since high concentrations were found at locations throughout the Edmonton region and not just downstream of the GBWTP, the data suggest that city stormwater runoff was a major source of this material.

8.3 Impacts

Although measured concentrations of chloride, sodium, and potassium at Pakan were significantly higher than concentrations at Devon, they remained low overall, and the pattern of ionic dominance remained unchanged. No particular or general impacts are thought to accrue from these increases in major ion concentrations.

A significant elevation in suspended solid loads in the river within and downstream of Edmonton may contribute to changes in the biota. In general, an increase in suspended solids contributes to greater turbidity which reduces the transmission of photosynthetically active radiation. This could suppress the autotrophic primary production of planktonic and attached algae, as well as that of the macrophytic community. High suspended-solid loads also enhance the scouring capacity of a river. Indirectly, benthic invertebrates may be impacted by an increase in sedimentation and habitat alteration, by a decrease in photosynthetically produced food, and by the scouring of attached plant material. These impacts are discussed in more detail in Section 12 (Chlorophyll-a) and Part 2 (Vol. 2: Zoobenthos).

9.0 METALS

Sampling for metals was done in both the flowing water component and the sediment component. The sampling schedule for the water component included 11 mainstem North Saskatchewan River (NSR) locations on 12 dates in 1982, and 6 mainstem NSR locations on 12 dates in 1983 (Tables 4.4 and 4.5). On 5-6 October 1983, sediment sampling was done at 5 mainstem locations: at one site for each of two locations, and at sites on both banks for each of 3 locations, for a total of 8 sites.

Table 5.1 summarizes methods and detection limits for metals and other variables assessed in this study. Additional details of field methods, laboratory methods, and interpretation are given in Sections 5.1 to 5.4.

9.1 Results and Discussion: Metals

The following patterns of responses were identified for metals in the water component:

- measurements consistently below the analytical detection limit.
- present above detection limit, but no seasonal or longitudinal pattern.
- seasonal change only.
- longitudinal change only.
- both seasonal and longitudinal change.

The metals following these patterns are listed in Table 9.1.

TABLE 9.1 Summary of metal responses in the water phase, North Saskatchewan River, 1982-1983.

Not Detectable	Little or No Change	Temporal Change	Spatial Change	Temporal and Spatial Change
Mercury	Copper	Iron	Nickel	Manganese
Cadmium	Chromium	Aluminum	Lead	
Selenium	Vanadium		Zinc	
Molybdenum	Arsenic			
Cobalt				
Beryllium				

TABLE 9.2 Metals below detection limit, in the water phase, North Saskatchewan River, 1982-1983

	Detection Limit
Mercury	$< 0.0001\ mg \cdot L^{-1}$
Cadmium	$< 0.0010\ mg \cdot L^{-1}$
Selenium	$< 0.0002\ mg \cdot L^{-1}$
Molybdenum	$< 0.0010\ mg \cdot L^{-1}$
Cobalt	$< 0.0010\ mg \cdot L^{-1}$
Beryllium	$< 0.0010\ mg \cdot L^{-1}$

Six metals were below the analytical detection limit in all samples collected during this study (Table 9.2). Among the six metals were mercury and cadmium which, along with most of their compounds, are known to have toxic effects on humans and on aquatic life (McNeely et al. 1979).

Four metals showed little or no change in concentration during the course of this study: copper, chromium, vanadium, arsenic. Median values and ranges for the Devon, Fort Saskatchewan, and Pakan locations are summarized in Table 9.3. Although some of these metals or their compounds are known to have toxic effects at much higher concentrations, values found were generally well below those likely to cause adverse effects on human or aquatic life (Alberta Environment 1977).

Iron and aluminum exhibited strong seasonal but little spatial change throughout this study. This response is linked to seasonal variations in flow, as demonstrated by a positive relationship between flow and concentration. This relationship stems from erosion during runoff and the subsequent transport of suspended materials by the river, a well known natural phenomenon. Figure 9.1 is a seasonal plot for iron at two locations, 50th Street Footbridge and Pakan. Figure 9.2 is a seasonal plot for aluminum at the Beverly Bridge location.

Iron and aluminum occur naturally in the rocks and soils of the NSR drainage basin; there are no identifiable point sources and most loading is natural.

TABLE 9.3 Metal showing little or no change, in the water phase, North Saskatchewan River, 1982-1983. Values are mg•L^{-1}.

	DEVON*		FORT SASKATCHEWAN**		PAKAN**	
	Median	Range	Median	Range	Median	Range
Copper	0.003	(0.001-0.016)	0.003	(0.001-0.024)	0.002	(0.001-0.016)
Chromium	0.004	(0.001-0.044)	0.004	(0.001-0.007)	0.004	(0.001-0.005)
Vanadium	0.003	(0.002-0.010)	0.004	(0.002-0.009)	0.003	(0.002-0.013)
Arsenic	0.0004	(0.0002-0.0011)	0.0005	(0.0002-0.0015)	0.0005	(0.0002-0.002)

* Composite samples.
** Centre site samples.

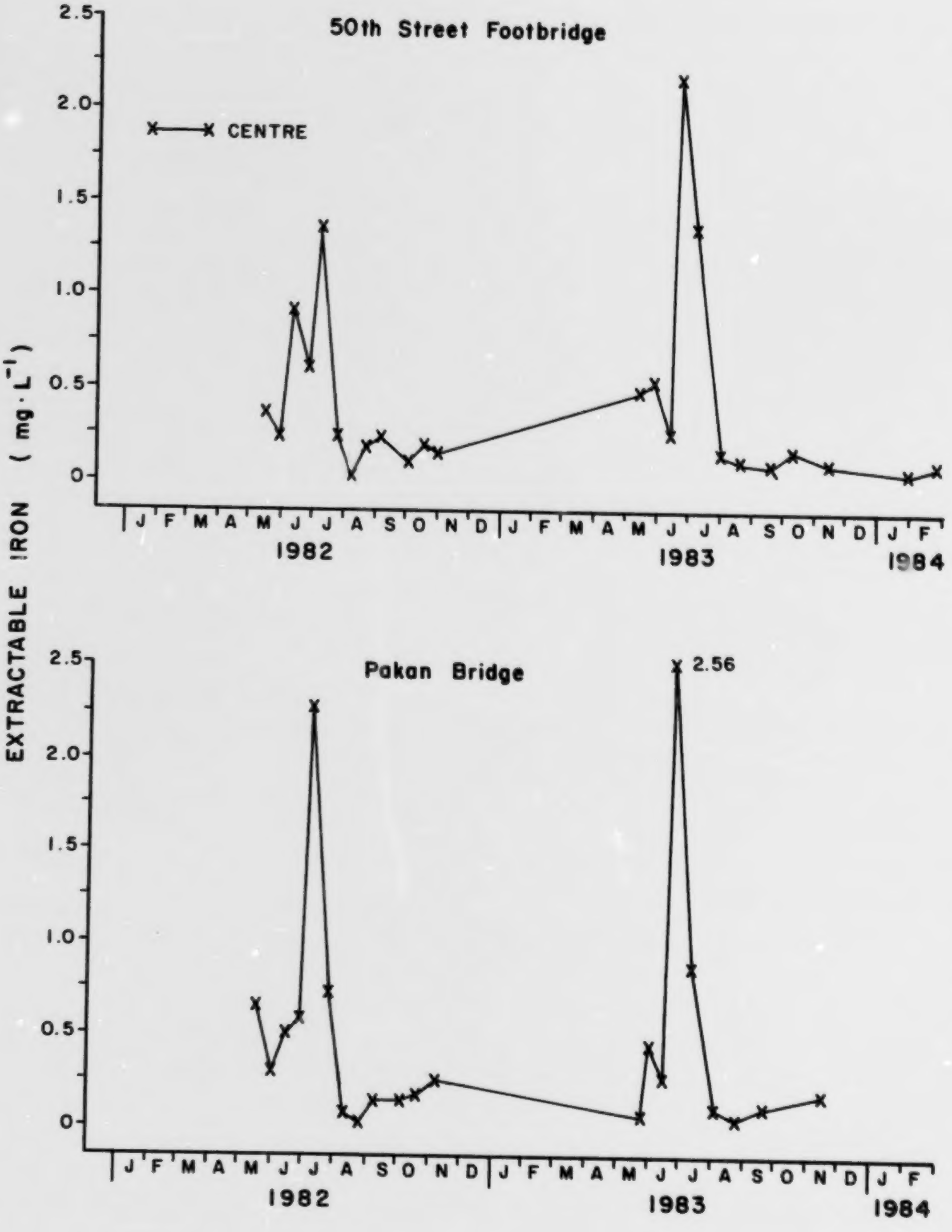


Fig. 9.1 Extractable iron at two NSR study locations, 1982-1983.

ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

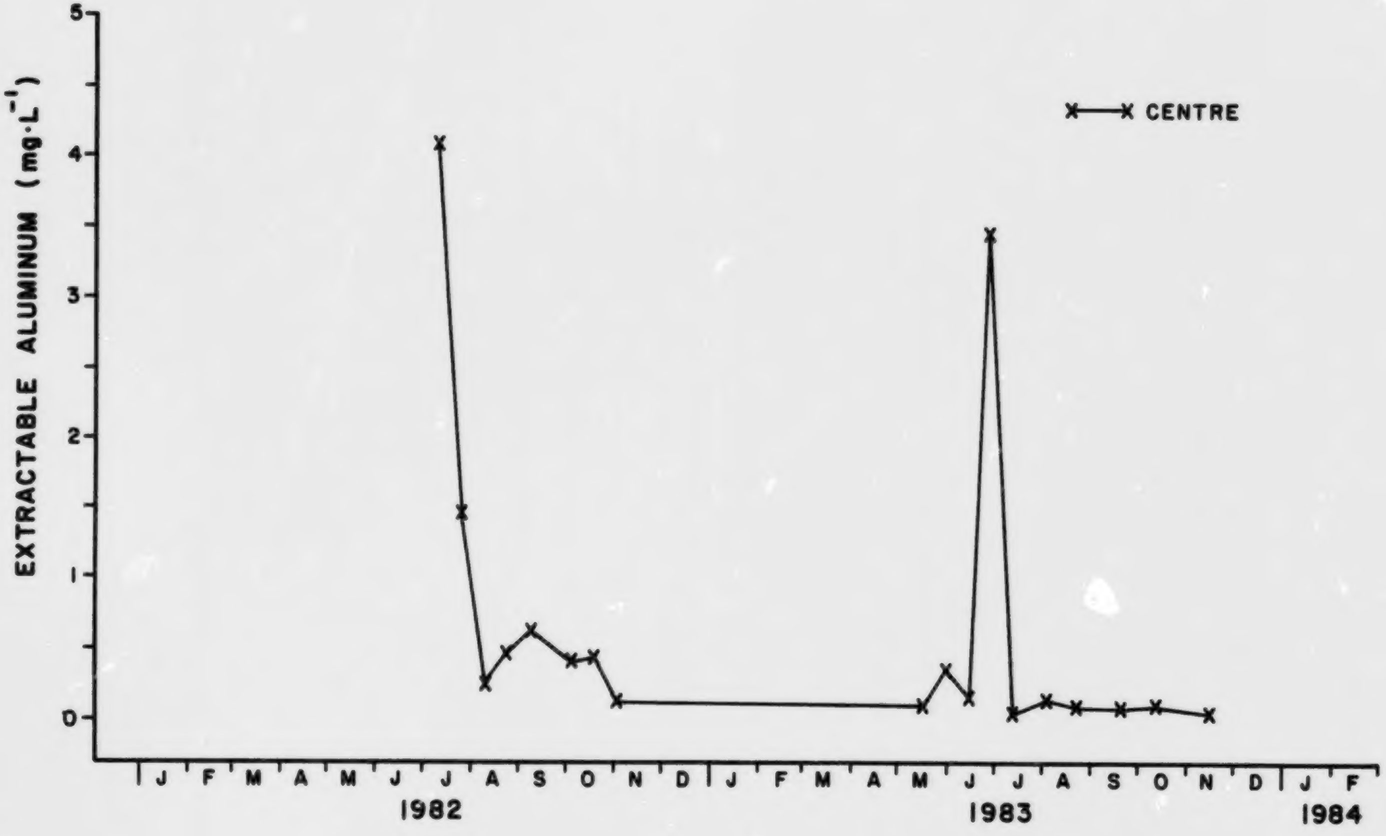


Fig. 9.2 Extractable aluminum at the Beverly bridge location, NSR, 1982-1983.

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

Manganese was the only metal which showed both seasonal and spatial changes over the sampling period. The prevailing trend for manganese was seasonal, and concentrations were associated with the transportation of eroded sediments during high flow periods (Fig. 9.3). The spatial effect was rather small and probably natural (Table 9.4). However, there was evidence of a small contribution from the Gold Bar Wastewater Treatment Plant (GBWTP - Fig. 9.4).

Manganese is similar to iron in chemical behavior and most commonly associated with it. Soils, sediments, and various metamorphic and sedimentary rocks are the usual sources of naturally occurring manganese, which seldom exceeds concentrations of 1.0 $mg{\cdot}L^{-1}$ in natural surface waters (McNeely et al. 1979). However, this metal is commonly used in industry and high loads in surface waters can be caused by industrial waste discharge or acid-mine drainage.

Lead and nickel showed small but definite spatial change. Changes in zinc concentrations were rather sporadic, although there was some evidence of increase in downstream direction. The longitudinal plots for lead and nickel are given in Figure 9.5.

In the case of nickel, right-bank sites showed increasing concentrations, whereas centre-channel and left-bank sites showed little or no change. The right-bank increase is due to industrial input in the Fort Saskatchewan area (Fig. 9.6). At Pakan, where the river is well mixed, the overall increase in nickel concentration was about 0.002 $mg.L^{-1}$, which matches the input loading.

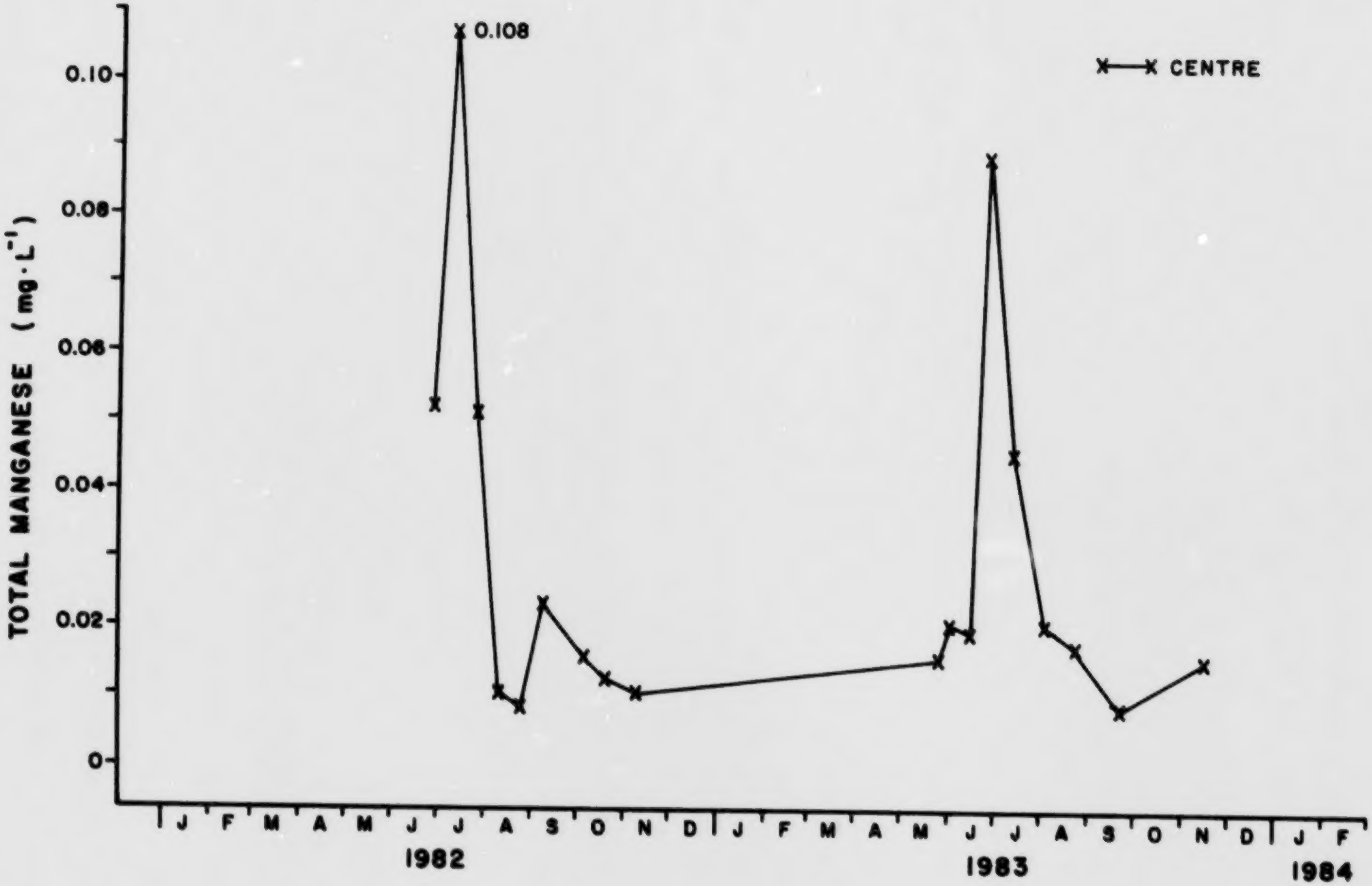


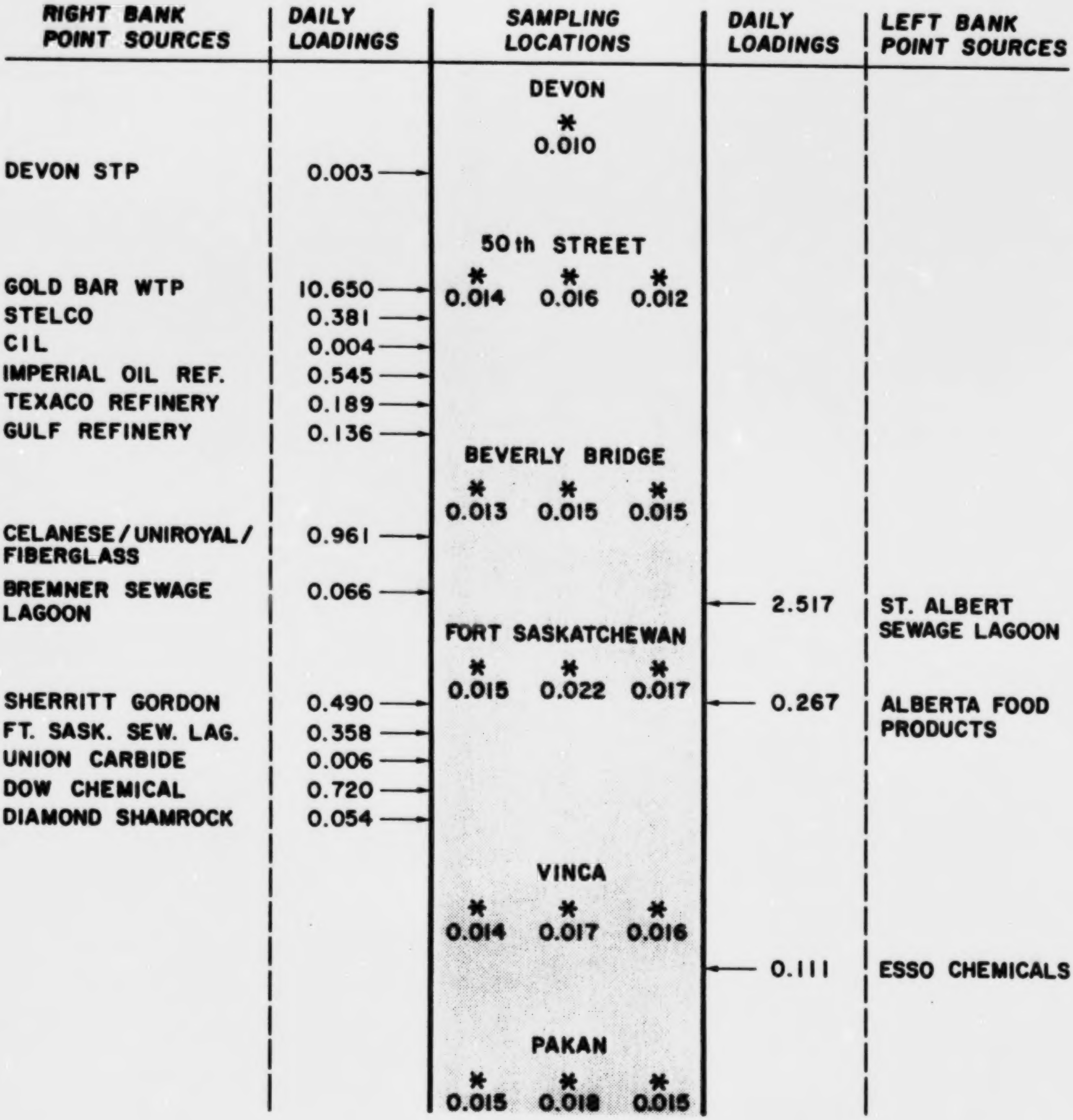
Fig. 9.3 Total manganese at Pakan bridge, NSR, 1982-1983.

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

TABLE 9.4. Manganese in the water phase, North Saskatchewan River, 1982-1983. Median and (range) values are mg•L^{-1}.

Location	Sites		
	Left Bank	Centre	Right Bank
Devon Bridge	-	0.010 (0.008-0.087)*	-
E. L. Smith WTP	-	0.012 (0.008-0.084)*	-
Rossdale WTP	0.015 (0.008-0.106)	0.011 (0.008-0.099)	0.015 (0.008-0.121)
50th Street Footbridge	0.014 (0.008-0.098)	0.016 (0.008-0.106)	0.012 (0.008-0.121)
Rundle Park Footbridge	0.012 (0.088-0.450)	0.010 (0.008-0.120)	0.012 (0.008-0.119)
Beverly Bridge	0.013 (0.008-0.135)	0.015 (0.008-0.114)	0.015 (0.008-0.119)
Clover Bar	0.016 (0.009-0.110)	0.013 (0.009-0.120)	0.018 (0.013-0.113)
Fort Saskatchewan	0.015 (0.008-0.092)	0.022 (0.008-0.094)	0.017 (0.009-0.093)
Sturgeon NSR Confluence	0.019 (0.013-0.115)	0.019 (0.008-0.100)	0.020 (0.011-0.107)
Vinca Bridge	0.014 (0.009-0.106)	0.017 (0.008-0.122)	0.016 (0.009-0.119)
Pakan Bridge	0.015 (0.008-0.117)	0.018 (0.008-0.108)	0.015 (0.008-0.124)

*composite sample


RIGHT BANK POINT SOURCES
DAILY LOADINGS
SAMPLING LOCATIONS
DAILY LOADINGS
LEFT BANK POINT SOURCES
DEVON
* 0.010
DEVON STP
0.003
50th STREET
* 0.014
* 0.016
* 0.012
GOLD BAR WTP
10.650
STELCO
0.381
CIL
0.004
IMPERIAL OIL REF.
0.545
TEXACO REFINERY
0.189
GULF REFINERY
0.136
BEVERLY BRIDGE
* 0.013
* 0.015
* 0.015
CELANESE / UNIROYAL / FIBERGLASS
0.961
BREMNER SEWAGE LAGOON
0.066
2.517
ST. ALBERT SEWAGE LAGOON
FORT SASKATCHEWAN
* 0.015
* 0.022
* 0.017
SHERRITT GORDON
0.490
0.267
ALBERTA FOOD PRODUCTS
FT. SASK. SEW. LAG.
0.358
UNION CARBIDE
0.006
DOW CHEMICAL
0.720
DIAMOND SHAMROCK
0.054
VINCA
* 0.014
* 0.017
* 0.016
0.111
ESSO CHEMICALS
PAKAN
* 0.015
* 0.018
* 0.015

TOTAL INDUSTRIAL LOAD = 3.867
TOTAL MUNICIPAL LOAD = 13.591

TOTAL DAILY LOAD = 17.458

Fig. 9.4 Diagrammatic representation of 1982-84 median manganese concentrations ($mg \cdot L^{-1}$) and estimated municipal and industrial point source loadings ($kg \cdot d^{-1}$) .

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

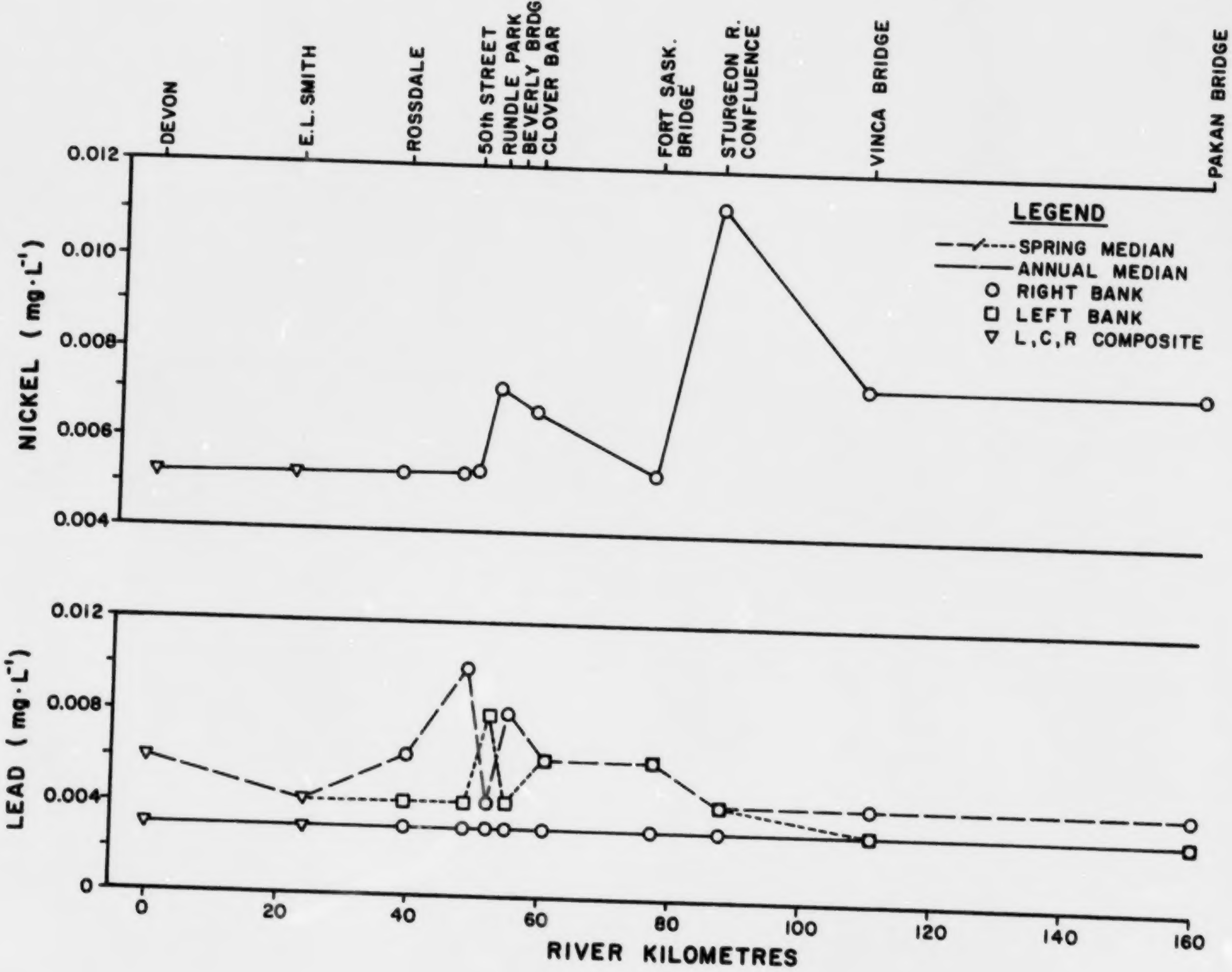
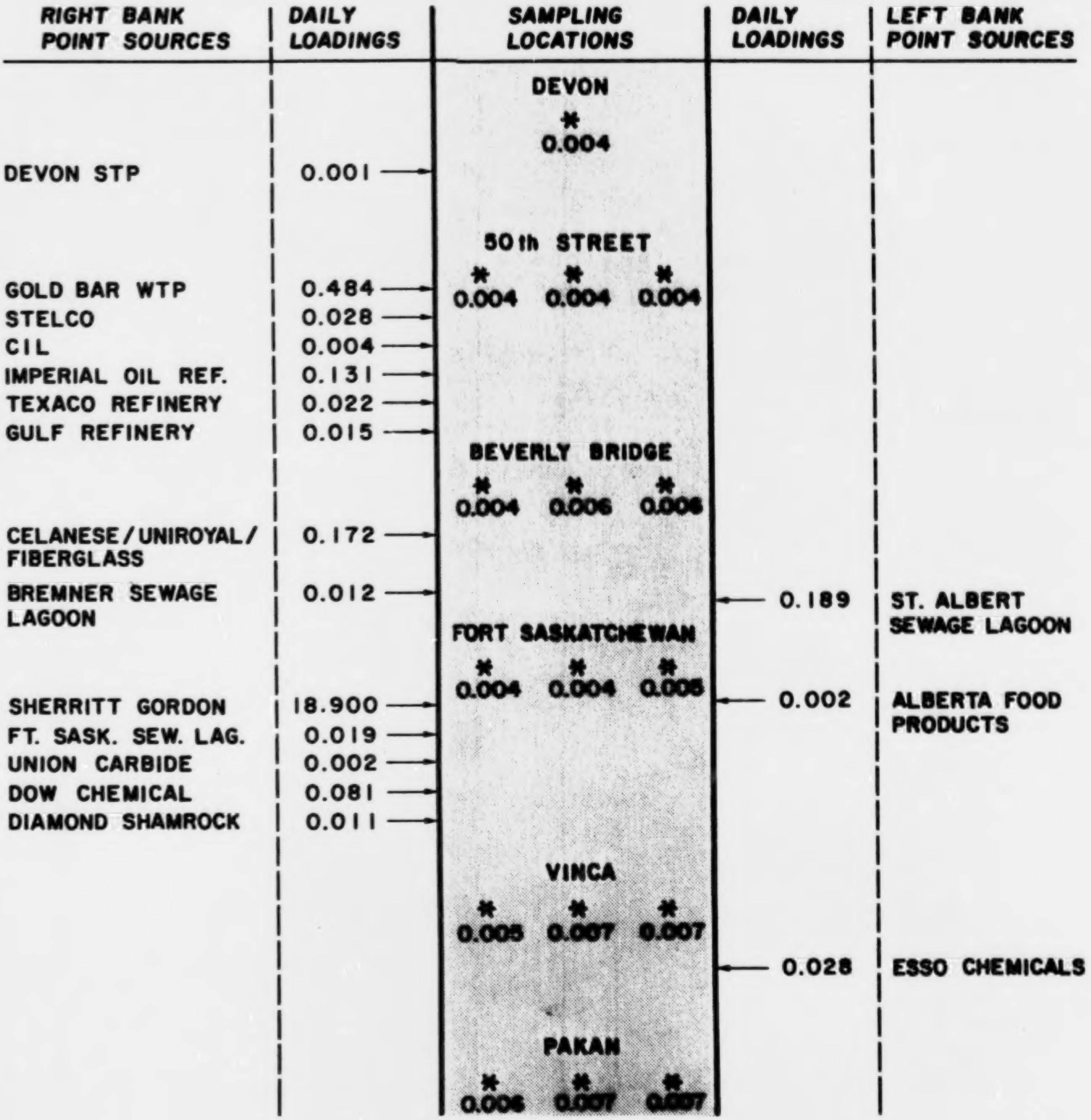


Fig. 9.5 Median concentrations of nickel and lead, NSR, 1982-1983.

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch


RIGHT BANK POINT SOURCES
DAILY LOADINGS
SAMPLING LOCATIONS
DAILY LOADINGS
LEFT BANK POINT SOURCES
DEVON
0.004
DEVON STP 0.001
50th STREET
0.004 0.004 0.004
GOLD BAR WTP 0.484
STELCO 0.028
CIL 0.004
IMPERIAL OIL REF. 0.131
TEXACO REFINERY 0.022
GULF REFINERY 0.015
BEVERLY BRIDGE
0.004 0.006 0.006
CELANESE/UNIROYAL/ FIBERGLASS 0.172
BREMNER SEWAGE LAGOON 0.012
0.189 ST. ALBERT SEWAGE LAGOON
FORT SASKATCHEWAN
0.004 0.004 0.005
SHERRITT GORDON 18.900
0.002 ALBERTA FOOD PRODUCTS
FT. SASK. SEW. LAG. 0.019
UNION CARBIDE 0.002
DOW CHEMICAL 0.081
DIAMOND SHAMROCK 0.011
VINCA
0.005 0.007 0.007
0.028 ESSO CHEMICALS
PAKAN
0.006 0.007 0.007

TOTAL INDUSTRIAL LOAD = 19.396
TOTAL MUNICIPAL LOAD = 0.705
TOTAL DAILY LOAD = 20.101

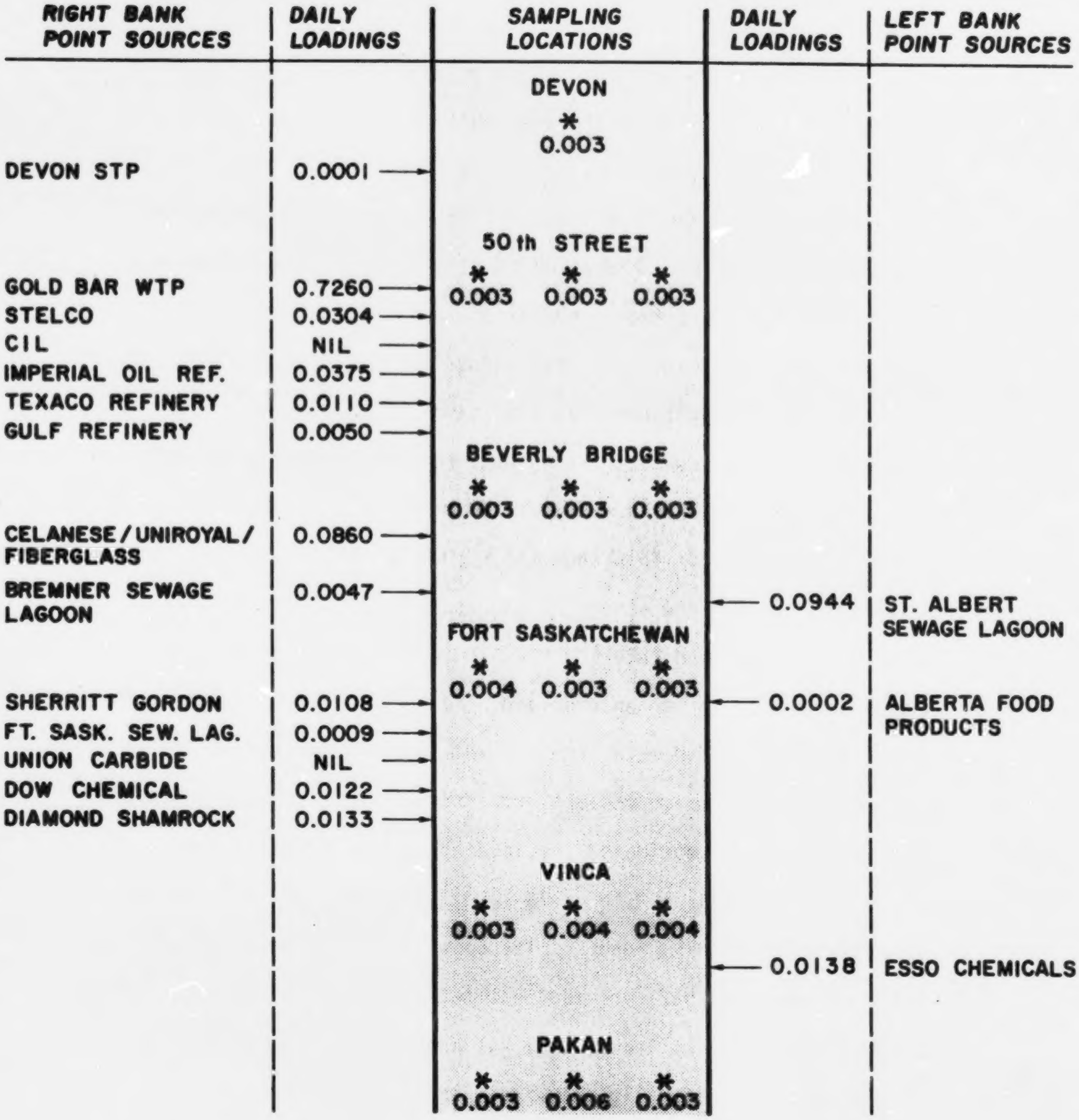
Fig. 9.6 Diagrammatic representation of 1982-84 median nickel concentrations ($mg \cdot L^{-1}$) and estimated municipal and industrial point source loadings ($kg \cdot d^{-1}$) .

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

Although nickel is relatively inert, it is seldom found in its native state. Most naturally occurring nickel in the aquatic environment is leached from igneous rocks. Anthropogenic sources include gases from the burning of fossil fuels and the incineration of wastes, and effluents from a number of industrial processes.

As shown in Figure 9.5, lead showed small but definite increases in left-bank and right-bank concentrations in the Edmonton area. Annual median lead concentrations upstream of Edmonton at Devon were virtually the same as those downstream of Edmonton at Pakan where the river is well mixed. This suggests either assimilation in the study section of the NSR downstream of Edmonton, or a small total input (Fig. 9.7). The lead entering the NSR in the Edmonton area was undoubtedly of anthropogenic origin, and most of it probably came from the burning of leaded motor fuels. The lead likely entered the river via storm sewers, which collect urban street runoff. Reynoldson and Livingstone (1983) estimated the loading of lead from all sewers upstream of Rossdale WTP to be 73 $kg.d^{-1}$ and 15 $kg.d^{-1}$ for two dates during the 1982 spring runoff. The snow disposal report for 1981-1982 (City of Edmonton 1982) provided estimates for total lead contained in two snow dumps: Groat Road (205.7 kg) and 105th Street (166.7 kg).

Lead occurs naturally and widely in the environment and occurs in both soluble and suspended forms. However, natural waters seldom contain high levels of lead. The input of lead from human activities usually exceeds all natural sources (McNeely et al. 1979).



RIGHT BANK POINT SOURCES	DAILY LOADINGS	SAMPLING LOCATIONS	DAILY LOADINGS	LEFT BANK POINT SOURCES
		DEVON * 0.003		
DEVON STP	0.0001 →			
		50th STREET * 0.003 * 0.003 * 0.003		
GOLD BAR WTP	0.7260 →			
STELCO	0.0304 →			
CIL	NIL →			
IMPERIAL OIL REF.	0.0375 →			
TEXACO REFINERY	0.0110 →			
GULF REFINERY	0.0050 →			
		BEVERLY BRIDGE * 0.003 * 0.003 * 0.003		
CELANESE/UNIROYAL/FIBERGLASS	0.0860 →			
BREMNER SEWAGE LAGOON	0.0047 →			
			← 0.0944	ST. ALBERT SEWAGE LAGOON
		FORT SASKATCHEWAN * 0.004 * 0.003 * 0.003		
SHERRITT GORDON	0.0108 →		← 0.0002	ALBERTA FOOD PRODUCTS
FT. SASK. SEW. LAG.	0.0009 →			
UNION CARBIDE	NIL →			
DOW CHEMICAL	0.0122 →			
DIAMOND SHAMROCK	0.0133 →			
		VINCA * 0.003 * 0.004 * 0.004		
			← 0.0138	ESSO CHEMICALS
		PAKAN * 0.003 * 0.006 * 0.003		

TOTAL INDUSTRIAL LOAD = 0.2202

TOTAL MUNICIPAL LOAD = 0.8261

TOTAL DAILY LOAD = 1.0463

Fig. 9.7 Diagrammatic representation of 1982-84 median lead concentrations ($mg \cdot L^{-1}$) and estimated municipal and industrial point source loadings ($kg \cdot d^{-1}$) .

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

Anthropogenic sources include emissions from internal combustion engines, smelting, refining, and many other manufacturing activities, and effluents from a wide spectrum of industries using lead salts.

Median values and the range of values for zinc fluctuated considerably and did not show a clear longitudinal trend (Table 9.5), although the number of high values increased in downstream direction (see Table 9.6, section 9.2). The loading summary identifies two point sources responsible for contributing most of the total load: Gold Bar Wastewater Treatment Plant and Sherritt Gordon (Fig. 9.8).

Zinc occurs naturally in the environment, but high levels (i.e. > 0.05 mg.L^{-1}) are usually associated with human, industrial and domestic activities. The total zinc levels determined in the NSR were somewhat higher than those reported for other rivers in Alberta (e.g. Blachford and Ongley 1984) or elsewhere in Canada (e.g. Environment Canada 1981, Kuntz 1984). However, most of the load was apparently natural (cf. levels at Devon Bridge). The fraction of total zinc in dissolved form is quite low at high pH levels, such as occur in the NSR; the dissolved fraction increases rapidly as pH levels drop below 7 (Shiller and Boyle 1985).

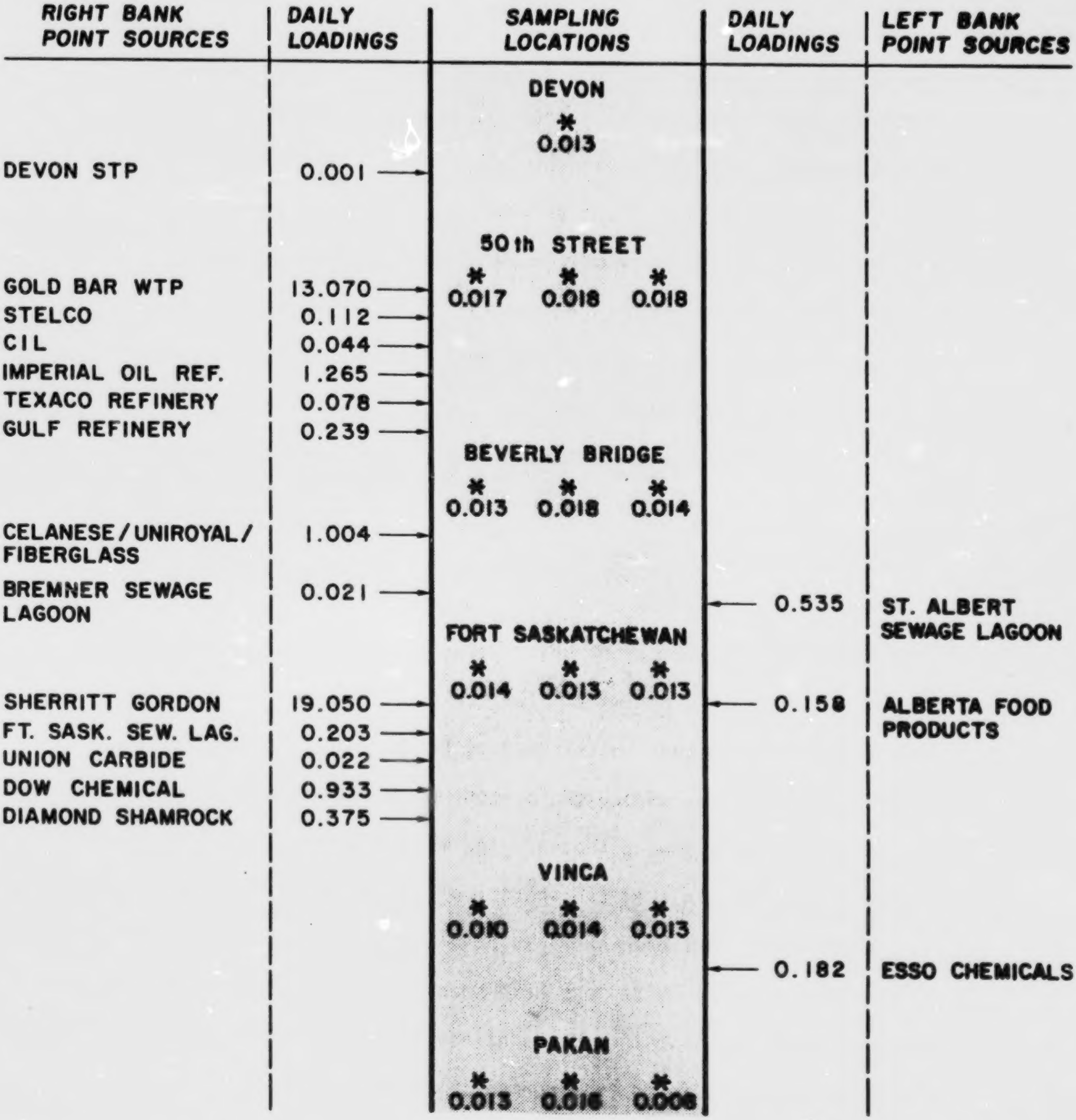
9.2 Surface Water Quality Objectives

The measured values for metals were compared with both Alberta Surface Water Quality Objectives (ASWQO, Alberta Environment 1977) or with Guidelines for Surface Water Quality (Environment Canada 1979)

TABLE 9.5 Zinc in the water phase, North Saskatchewan River, 1982-1983. Median and (range) values are mg•L^{-1}.

	Sites		
Location	Left Bank	Centre	Right Bank
Devon Bridge	-	0.013 (0.001-0.043)*	-
E. L. Smith WTP	-	0.029 (0.001-0.048)*	-
Rossdale WTP	0.029 (0.001-0.042)	0.023 (0.001-0.156)	0.031 (0.014-0.045)
50th Street Footbridge	0.017 (0.002-0.058)	0.018 (0.001-0.048)	0.018 (0.001-0.069)
Rundle Park Footbridge	0.034 (0.003-0.050)	0.037 (0.017-0.073)	0.031 (0.015-0.048)
Beverly Bridge	0.013 (0.001-0.054)	0.018 (0.001-0.045)	0.014 (0.004-0.065)
Clover Bar	0.036 (0.001-0.050)	0.028 (0.012-0.062)	0.037 (0.002-0.058)
Fort Sask. Bridge	0.014 (0.001-0.057)	0.013 (0.011-0.055)	0.013 (0.003-0.064)
Sturgeon NSR Confluence	0.023 (0.006-0.064)	0.021 (0.002-0.043)	0.037 (0.017-0.057)
Vinca Bridge	0.010 (0.001-0.046)	0.014 (0.001-0.053)	0.013 (0.003-0.051)
Pakan Bridge	0.013 (0.003-0.041)	0.016 (0.001-0.057)	0.008 (0.001-0.054)

*composite sample


RIGHT BANK POINT SOURCES
DAILY LOADINGS
SAMPLING LOCATIONS
DAILY LOADINGS
LEFT BANK POINT SOURCES
DEVON
0.013
DEVON STP
0.001
50th STREET
GOLD BAR WTP
13.070
0.017
0.018
0.018
STELCO
0.112
CIL
0.044
IMPERIAL OIL REF.
1.265
TEXACO REFINERY
0.078
GULF REFINERY
0.239
BEVERLY BRIDGE
0.013
0.018
0.014
CELANESE / UNIROYAL / FIBERGLASS
1.004
BREMNER SEWAGE LAGOON
0.021
0.535
ST. ALBERT SEWAGE LAGOON
FORT SASKATCHEWAN
0.014
0.013
0.013
SHERRITT GORDON
19.050
0.158
ALBERTA FOOD PRODUCTS
FT. SASK. SEW. LAG.
0.203
UNION CARBIDE
0.022
DOW CHEMICAL
0.933
DIAMOND SHAMROCK
0.375
VINCA
0.010
0.014
0.013
0.182
ESSO CHEMICALS
PAKAN
0.013
0.016
0.008

TOTAL INDUSTRIAL LOAD = 23.462
TOTAL MUNICIPAL LOAD = 13.830

TOTAL DAILY LOAD = 37.292

Fig. 9.8 Diagrammatic representation of 1982-84 median zinc concentrations ($mg \cdot L^{-1}$) and estimated municipal and industrial point source loadings ($kg \cdot d^{-1}$) .

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

when no ASWQO criteria exist. Measured values in excess of the Objectives were treated as exceedences.

Most metal concentrations determined during this study were at levels falling within the ASWQO; some could not be considered to exceed limits because natural concentrations exceed ASWQO criteria. Six metals were below the analytical detection limits and, therefore, were within the ASWQO guidelines (mercury, cadmium, selenium, molybdenum, cobalt, and beryllium). Four metals (copper, chromium, arsenic, and vanadium) occurred above the detection limit, but were within the ASWQO guidelines.

There are no Alberta or federal surface or drinking water objectives for aluminum or nickel. However, concentrations of nickel should be less than 0.025 $mg.L^{-1}$ for the protection of sensitive aquatic life (Great Lakes Water Quality Board 1976). Nickel was within this guideline during the present study. The oral toxicity of nickel is extremely low, although a few medical conditions have been linked to very high nickel concentrations in air or water.

Aluminum has not been shown to pose a hazard to human health, and so no drinking water guidelines have been set. It is recommended that water supplies for livestock contain less than 5 $mg.L^{-1}$ to avoid potential adverse affects (Environmental Studies Board 1973).

For three metals (iron, manganese and zinc), natural levels approached or exceeded the ASWQO criteria. No adverse health problems have been associated with naturally occurring iron concentrations, but high concentrations are considered objectionable for drinking water or industrial purposes because of taste, discoloration, scaling and iron-bacteria problems. High iron concentrations may contribute to precipitation problems which adversely affect aquatic life. A criterion level of 0.300 $mg.L^{-1}$ has generally been proposed for the protection of aquatic life and the assurance of quality surface water (Great Lakes Water Quality Board 1976, Alberta Environment 1977).

Manganese is an essential element for the nutrition of humans and most other life forms. It is unlikely that levels in surface waters ever reach toxic levels for livestock, so no criteria have been set. Established criteria for drinking water (Department of National Health and Welfare 1969) or surface waters (Alberta Environment 1977) of 0.05 $mg.L^{-1}$ are based mainly on aesthetic considerations, particularly taste.

Zinc complied with the ASWQO criteria in 478 of 500 samples. The few exceedences were scattered among all study locations except Devon and E.L. Smith (Table 9.6). However, maximum levels at these two upstream locations were very close to the ASWQO of 0.05 $mg.L^{-1}$. Although the pattern was not entirely clear, contributions from municipal wastewater treatment plants (particularly GBWTP) and industries (particularly Sherritt Gordon) were likely the reason for some of the exceedences (see Table 9.5). The occurrence of sporadic exceedences upstream of major municipal or industrial discharges (i.e. 50th Street Footbridge and Rossdale WTP) implicated stormsewers and the urban surface runoff which they carry.

TABLE 9.6 Zinc in the water phase, North Saskatchewan River, 1982-1983; comparison of results with Alberta Surface Water Quality Objectives.*

Location	Number of values complying with objectives	Maximum Level (mg•L^{-1})
Devon Bridge	24/24	0.043
E. L. Smith WTP	12/12	0.048
Rossdale WTP	35/36	0.156
50th Street Footbridge	61/64	0.069
Rundle Park Footbridge	33/36	0.073
Beverly Bridge	69/70	0.065
Clover Bar	33/36	0.062
Fort Saskatchewan Bridge	49/55	0.064
Sturgeon-NSR confluence	32/33	0.064
Vinca Bridge	66/67	0.051
Pakan Bridge	64/67	0.057
Total	478/500	

*Objective for zinc is 0.05 mg•L^{-1}.

Zinc is relatively non-toxic to humans, even at levels many times as high as those determined in the NSR in 1982-1983 (McNeely et al. 1979). Most terrestrial animals can tolerate high levels of zinc in their drinking water (Environmental Studies Board 1973). Many aquatic organisms, especially fish, are sensitive to low zinc concentrations, but toxicity varies considerably depending on pH levels, water hardness, and the presence of other metals. Many studies concerning potential zinc toxicity are reviewed by Taylor and Demayo (1980).

Lead was the only metal which had concentrations exceeding the ASWQO criteria and which could be attributed mainly to non-natural sources. There were only seven exceedences compared to 310 compliances, and all exceedences were in the Edmonton-Fort Saskatchewan portion of the NSR study section (Table 9.7). They occurred mainly during spring and in the poorly mixed part of the NSR downstream of the greater Edmonton area (see section 3.0). The highest level detected was 0.112 $mg.L^{-1}$. All lead levels measured upstream of Rossdale or downstream of Fort Saskatchewan complied with the ASWQO.

The bioaccumulation of lead by living organisms has become a cause for concern in recent years. Lead is a toxic material and can accumulate in the bones of humans and animals. The toxic effect of lead on fish is reported to decrease as hardness and dissolved oxygen increase, a clear example of the interrelationships which govern the ultimate effects of many variables in the aquatic environment. Usually, aquatic criteria are more stringent than those set for

TABLE 9.7 Lead in the water phase, North Saskatchewan River, 1982-1983; comparison of results with Alberta Surface Water Quality Objectives.*

Location	Number of values complying with objective	Maximum Level (mg•L^{-1})
Devon Bridge	12/12	0.014
E. L. Smith WTP	12/12	0.022
Rossdale WTP	35/36	0.090
50th Street Footbridge	34/36	0.078
Rundle Park Footbridge	35/36	0.112
Beverly Bridge	35/36	0.084
Clover Bar	36/36	0.024
Fort Saskatchewan Bridge	28/30	0.104
Sturgeon-NSR confluence	33/33	0.050
Vinca Bridge	22/22	0.010
Pakan Bridge	28/28	0.010
Total	310/317	

*Objective for lead is 0.05 mg•L^{-1}.

public drinking waters. For the former, a limit of 0.03 $mg.L^{-1}$ has been proposed for lead (Environmental Studies Board 1973), whereas a maximum concentration of 0.05 $mg.L^{-1}$ is usually set for drinking water (Alberta Environment 1977, Department of National Health and Welfare 1979).

9.3 Impacts: Metals

Sixteen metals were analyzed for in this study. With the possible exception of lead, there was no evidence of impact from these on the aquatic environment in the NSR between Devon and Pakan. Although lead levels occasionally exceeded ASWQO, persistent elevated levels were not measured and differences in lead levels between Devon and Pakan were not significant. There is no known point source for lead; instead, the main source is probably surface runoff, which enters the river through storm sewers. Such a diffuse source is difficult to assess or contain.

The fate of lead entering the NSR in the vicinity of Edmonton is not known. The possibility of accumulation in sediments or bioaccumulation in aquatic organisms must be considered, although there is no evidence for such accumulation at the present time.

In general, the levels of metals found in the NSR were low enough that their presence in the river downstream of Edmonton cannot be considered to impair the quality of water for normal domestic or industrial use.

9.4 Sediment

The results of the sediment analyses for the metals are given in Table 9.8. Since there are no quality standards for the sediment component, comparable values for the Red Deer River and the Drywood Creek are shown. Most values for the three streams are very similar.

TABLE 9.8 Metals* in North Saskatchewan River Sediments, 5-6 October, 1983, with comparisons to the Red Deer River and Drywood Creek.

	Devon	50th Street		Beverly Bridge		Pakan		Vinca	Red Deer River	Drywood Creek
		L	R	L	R	L	R			
Lead	17	29	20	62	17	19	22	15	10-40	15-30
Copper	21	18	17	27	14	11	20	14	5-25	10-20
Nickel	25	25	26	23	28	26	37	25	20-50	20-25
Arsenic	5	4	6	4	5	4	5	5	5-10	5-6
Cadmium	0.3	0.3	0.2	0.7	0.2	0.2	0.3	0.2	0.2-0.7	0.2-0.4
Mercury	0.08	0.08	0.07	0.12	0.04	0.06	0.06	0.07	0.06-0.18	0.03-0.07
Zinc	77	74	71	109	72	60	80	64	60-110	50-200
Chromium	62	53	55	65	61	47	68	53	20-120	50-70

* All values in $ug \cdot g^{-1}$.

10.0 ORGANIC COMPOUNDS

The organic compounds found in the North Saskatchewan River (NSR) and its tributaries originate from natural sources and from the agricultural, resource development, and industrial activities within the basin (Figs. 2.1 and 2.2).

Natural organic compounds are associated with or derived from soils, the chemical and biological degradation of plants and animal residues, the weathering of carbonaceous materials (including coal), and the biosynthetic activities of organisms. Such natural organics can be expected to occur in the aquatic environment. For instance, microbial degradation (eg. by bacteria or fungi) of lignin and lignin-like materials contained in vascular plants and their detritus is one of many processes which results in the natural occurrence of certain phenolic materials. Other organics derived from these and other natural sources include tannin, asphaltenes, aliphatic hydrocarbons, humic substances, many polar compounds, and trace amounts of aromatic hydrocarbons.

Natural non-humic substances, which include carbohydrates, proteins, peptides, amino acids, fats, waxes, and low molecular weight organic acids, are attacked relatively readily by microorganisms and usually have a short life span in the environment. In contrast, humic substances, which usually constitute a large fraction of the total organics, are known to be refractory to biological degradation. They are not single molecules, but associations of molecules of microbiological, polyphenolic, and lignin origins that range in molecular weight from a few hundred to several thousand and vary in composition from source to source. The humic compounds in the association are produced by microorganisms or derived from aquatic and terrestrial plants.

In addition to the natural loadings of organic substances into the NSR, there are anthropogenic inputs of natural and synthetic organic compounds associated with domestic, urban, agricultural, resource-development, and industrial activities within the basin.

With regard to organic compounds in the environment, volatilization and long-range transport may occur during release, storage in lagoons, and transport by the streams and rivers. The compounds that remain in the aquatic environment in suspension, emulsion, or solution can be partitioned into the aqueous and sediment phases where they may undergo biotic and abiotic transformation and/or degradation. In view of the very complex nature of organic substances in the environment, comparatively few data were collected during this study. Consequently, the transport, transformations, and ultimate fate of the organic constituents in the NSR have not been resolved, nor have the causes of specific event problems (e.g., tainting, taste, and odor problems). This section of the overall report is intended as an overview assessment of the results from surveys conducted during 1982 and 1983.

Water samples on selected dates in 1982 were taken at various locations between E. L. Smith Water Treatment Plant and Pakan Bridge. On one date in 1983, eleven transect sediment samples and six transect-composite water samples were collected from locations between and including Devon and Pakan Bridge. These 1983 samples were analyzed for organic pesticides and scanned for PCBs and U.S. EPA priority pollutants. A summary of the sampling dates and analyses performed for organic materials is given in Tables 4.4 and 4.5.

10.1 Results and Discussion - Organic Compounds

10.1.1 Pesticides, Herbicides, and PCBs

Analyses of NSR water samples collected during the open-water season of 1982 and on 5 and 6 October 1983, and of sediment samples collected on 5 and 6 October 1983 revealed no detectable levels of chlorinated pesticides, chlorinated herbicides, organophosphorus or organonitrogen compounds, or PCBs. Analysis in each of these groups involved scans for several specific chemical compounds.

Organochlorine residues such as polychlorinated biphenyls (PCBs) are considered deleterious to aquatic systems because the parent compounds and their metabolites persist in the environment, accumulate in the biota (especially in lipids), and are known mutagens and suspected carcinogens.

10.1.2 Phenolic Materials

Phenolic materials as a group were analyzed as one of the standard variables. The analytical method (NAQUADAT Code 06532L) used is the 4-amino-antipyrene colorimetric method which is accurate for determining the quantity of phenol but not the quantity of all phenolic compounds (e.g., parasubstituted alkyl, aryl, nitro, benzyl, nitroso, and aldehyde forms). Consequently, the results from the colorimetric method are conservative estimates of the amounts present in the samples.

Overall, the analysis of samples collected along the NSR for phenolic materials on most sampling dates in 1982 and some in 1983 produced very low concentrations, frequently equal to or less than the analytical detection limit of 0.002 $mg \cdot L^{-1}$ (Figure 10.1). Detectable concentrations ranging between 0.002 and 0.005 $mg \cdot L^{-1}$ were common during the 1983 open-water seasons. Values greater than 0.005 $mg \cdot L^{-1}$ occurred in the tributary streams, but only rarely (11 times in 2 years) at a few locations in the mainstem NSR (Tables 10.1 and 10.2).

Information on the phenolic materials concentrations in the NSR in the Rocky Mountain and the foothills regions is based on the analysis of 12 samples collected at Rocky Mountain House and at Drayton Valley between 16 June 1983 and 1 February 1984. The concentration reported for each of the 12 samples was less than 0.002 $mg \cdot L^{-1}$.

Further downstream at Devon between 19 May 1982 and 29 February 1984, concentrations in 19 of 24 samples were equal to or less than 0.002 $mg \cdot L^{-1}$, three samples had values of 0.003 $mg \cdot L^{-1}$, and only two samples exceeded 0.005 $mg \cdot L^{-1}$: 14 June 1983 (0.009 $mg \cdot L^{-1}$) and

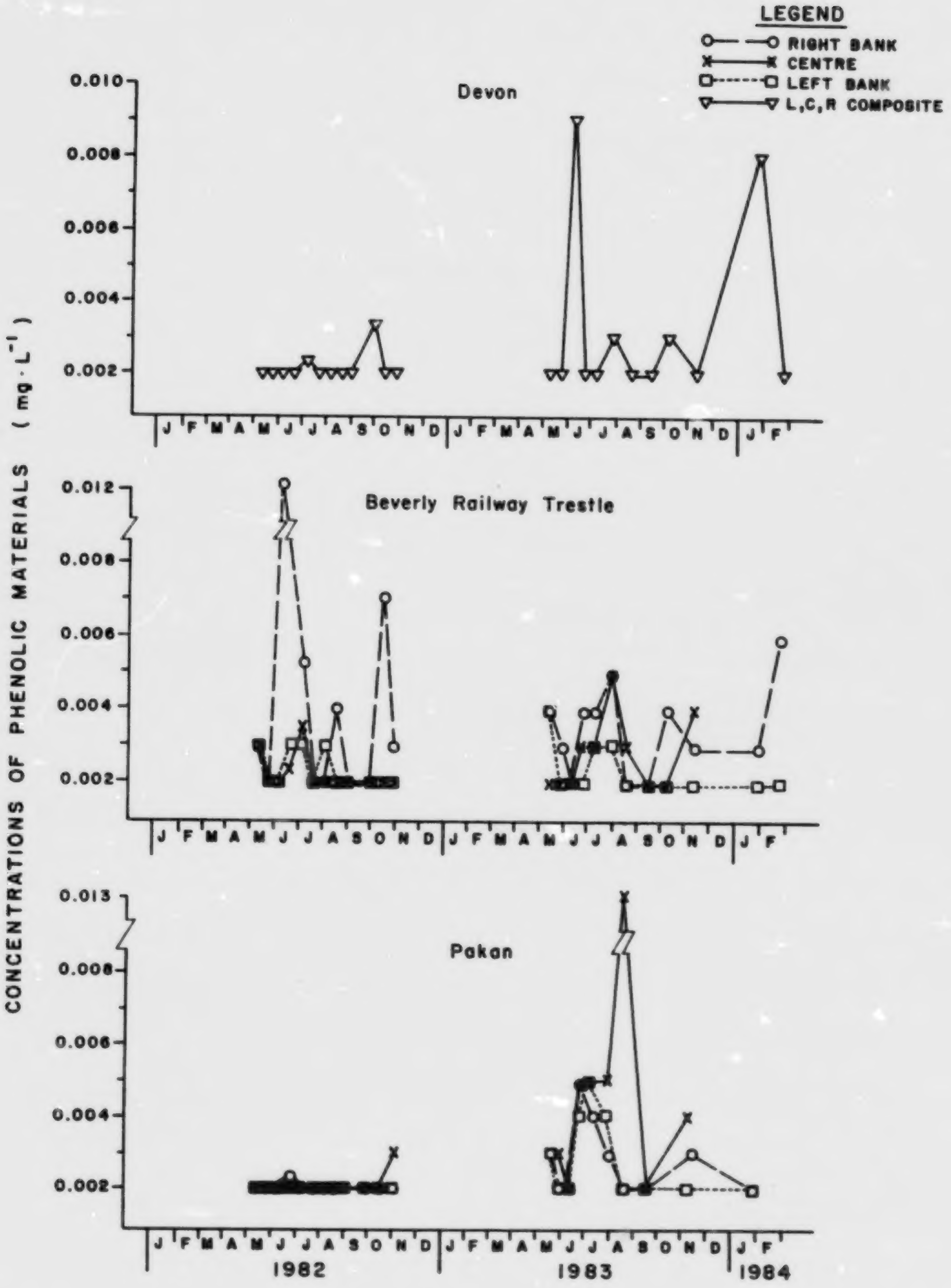


Fig. 10.1 Variations in the concentrations of phenolic materials in water samples collected at three locations along the North Saskatchewan River.

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

TABLE 10.1 Phenolic materials concentrations (mg.L^{-1}) and estimated loadings (kg.d^{-1}) from tributaries for sampling dates in 1983.

	Whitemud Creek		Millcreek	Fulton Creek	Gold Bar Creek	Redwater River		Sturgeon River		Beaverhill Creek	
Sampling Dates in 1983	Conc.	Loading	Conc.	Conc.	Conc.	Conc.	Loading	Conc.	Loading	Conc.	Loading
17 - 18 May	0.013	----	0.023	----	0.012	----	----	----	----	----	----
26 May - 2 June	0.013	0.110	----	----	----	0.009	0.076	0.007	1.421	----	----
16 June	----	----	----	----	----	0.003	0.102	0.008	0.541	----	----
28 - 29 June	0.009	11.880	0.015	0.049	ND	0.020	14.040	0.008	8.325	0.020	23.010
13 - 14 July	0.017	17.400	0.022	0.061	0.012	0.014	4.500	0.012	11.070	0.015	4.061
3 - 4 August	0.024	2.640	0.035	0.093	0.011	0.015	1.015	0.011	4.653	0.017	0.719
23 - 24 August	0.009	----	----	0.150	0.013	0.008	0.068	0.008	1.150	0.005	----
20 - 21 September	0.005	----	----	----	0.027	0.009	0.076	0.008	0.338	0.003	----
12 October	0.124	----	----	----	0.015	----	----	----	----	----	----
15 - 17 November	0.011	----	----	----	----	0.011	----	0.008	----	0.012	----

ND = Not Detectable
---- = No Data

TABLE 10.2 Occurrences along the North Saskatchewan River of phenolic materials concentrations greater than 0.005 $mg \cdot L^{-1}$.

Sampling Date	DEVON Composite	ROSSDALE Right	ROSSDALE Centre	RUNDLE FOOTBRIDGE Right	BEVERLY RAILWAY TRESTLE Right	BEAVERHILLS CREEK CONFLUENCE Left	PAKAN Centre
1982							
15 June					0.012		
29 June		0.007	0.009				
13 July				0.008			
19 October					0.007		
1983							
14 June	0.009						
29 June						0.006	
14 July						0.006	
24 August							0.013
1984							
1 February	0.008						
29 February					0.006		

1 February 1984 (0.008 $mg \cdot L^{-1}$). The relative proportions of the numbers of very low, moderate (between 0.002 and 0.005 $mg \cdot L^{-1}$), and high (greater than 0.005 $mg \cdot L^{-1}$) values were found to persist in transect samples collected at all downstream stations except the Beverly Bridge (right-bank site), where there were fewer low values and an increase in the number of occurrences of phenolic materials concentrations greater than 0.003 $mg \cdot L^{-1}$.

A number of factors can cause the transformation or removal of various organic constituents as they travel from points of release, through major drains or lagoons, and into receiving waters. Examples of these factors are photolysis, adsorption, aeration (which aids volatilization and oxidation), metabolic degradation, and microbial degradation, if suitable organisms are present. Furthermore, dilution or masking due to variations in effluent quantity and quality would increase the chance of not detecting phenolic materials in a large river, such as the NSR, on any two successive sampling dates.

The presence of phenolic materials at concentrations greater than 0.002 $mg \cdot L^{-1}$ has been observed in other Alberta rivers. However, detectable levels generally occur in summer and are believed to derive from natural seasonal processes such as those described previously. The presence of high levels of phenolic materials in the NSR water samples collected at Devon on 1 February 1984 and within and below Edmonton reflects inputs from tributary streams (Table 10.1) and point-source discharges (Table 10.3) entering the NSR.

TABLE 10.3 Phenolic materials concentrations ($mg.L^{-1}$) and estimated mean daily loadings ($kg.d^{-1}$) from municipal sewage discharges, NSR, 1983.

Sampling Dates in 1983	Devon Sewage Treatment Plant		Gold Bar Wastewater Treatment Plant		Bremner Sewage Lagoons		Ft. Saskatchewan Sewage Lagoons		St. Albert Sewage Lagoons		Total Loading from Municipal Sewage Plants
	Conc.	Loading	Conc.	Loading	Conc.	Loading	Conc.	Loading	Conc.	Loading	
17 - 18 May	0.012	0.018	0.015	3.359	-----	-----	0.196	0.590	0.206	2.262	6.229
31 May - 2 June	0.011	0.014	0.017	4.042	-----	-----	0.186	0.563	0.171	2.202	6.821
14 - 16 June	0.011	0.017	0.012	2.826	0.454	10.360	0.189	0.588	0.047	0.520	14.311
28 - 29 June	0.007	0.015	0.010	3.505	0.379	10.390	0.202	0.696	0.029	0.430	15.036
13 - 14 July	0.007	0.013	0.011	3.452	0.306	12.280	0.137	0.464	-----	-----	16.209
3 - 4 August	0.012	0.021	0.011	3.037	0.033	3.906	0.126	0.373	0.018	0.207	7.541
23 - 24 August	0.007	0.011	0.010	2.470	-----	-----	0.119	0.389	0.014	0.159	3.029
20 - 21 September	0.007	0.011	0.052	12.150	0.028	0.543	0.137	0.329	0.014	0.150	13.183
12 - 13 October	0.011	0.017	0.013	2.872	-----	-----	-----	-----	-----	-----	-----
15 - 16 November	0.009	0.014	0.012	2.853	-----	-----	-----	-----	-----	-----	-----

A selection of longitudinal plots of phenolic materials concentrations in transect samples collected during the summer and autumn of 1982 and summer of 1983 is given in Figures 10.2 and 10.3. These plots demonstrate the general tendency for levels to be higher in the right-bank samples collected in the vicinity of Edmonton than the corresponding left-bank samples. This is due to the combined effects of many small inputs of phenolic compounds from municipal and industrial sources.

10.1.3 Other Organic Compounds

10.1.3.1 Water Phase

Water samples collected in the October 1983 survey were analyzed for PCBs, acid and base/neutral fractions, and purgeable priority pollutants. The purgeable group consisted of benzene and 23 compounds from the general categories of haloalkanes, haloalkenes, alkylbenzenes, and mono- and dichloro-benzenes. For this group, there were a few single measurements above the detection level: toluene and metaxylene (0.0002 $mg.L^{1}$ at Devon), tetrachloroethylene (0.0001 $mg.L^{-1}$ at Beverly Bridge), xylene (0.0001 $mg.L^{-1}$ at Pakan). Most of the other purgeable priority pollutants were detected in the water samples of the October 1983 survey, but all were at levels below 0.0001 $mg{\bullet}L^{-1}$, except those noted above.

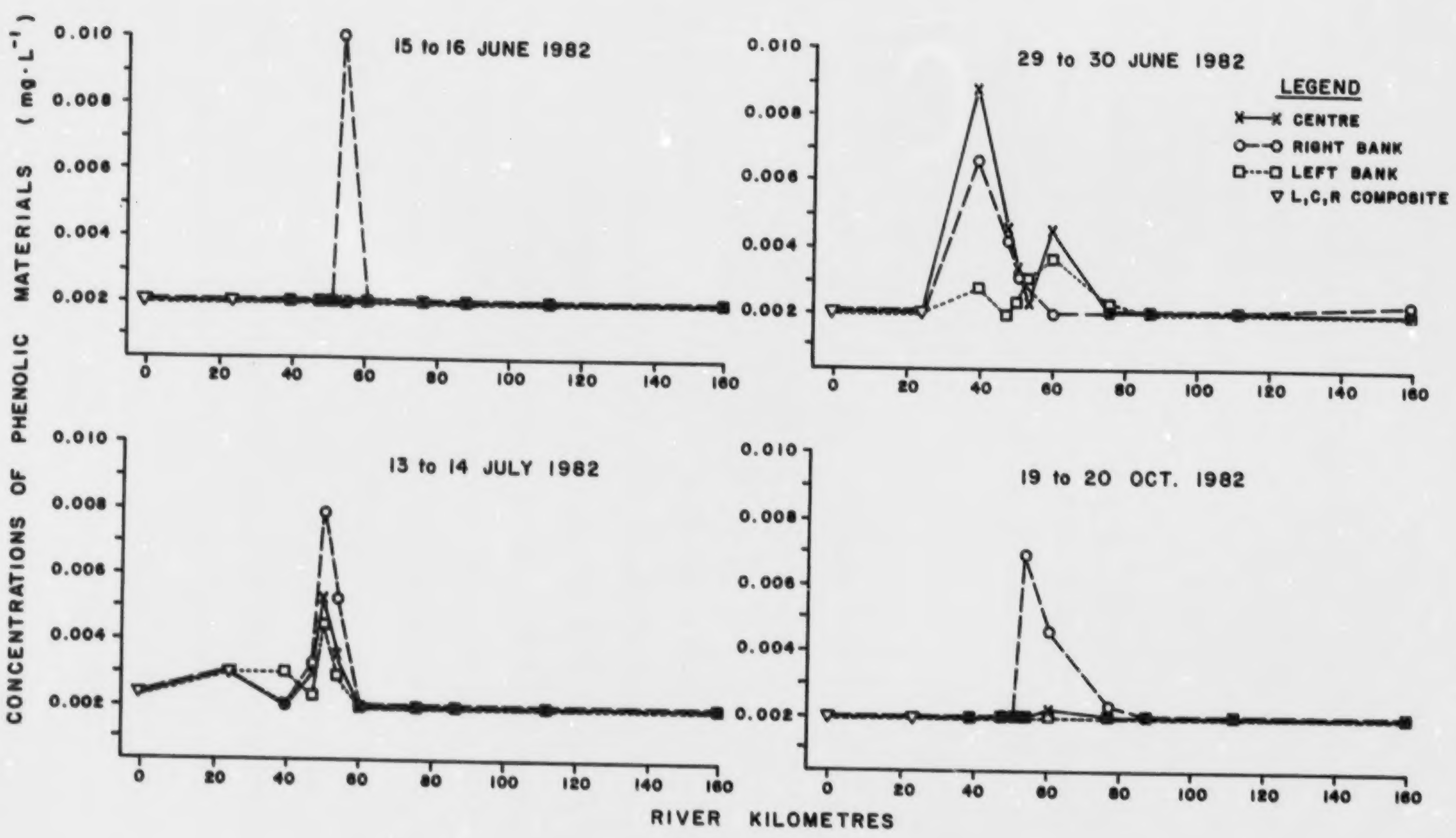


Fig. 10.2 Longitudinal variations in phenolic materials concentrations in the North Saskatchewan River for selected dates in 1982.

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

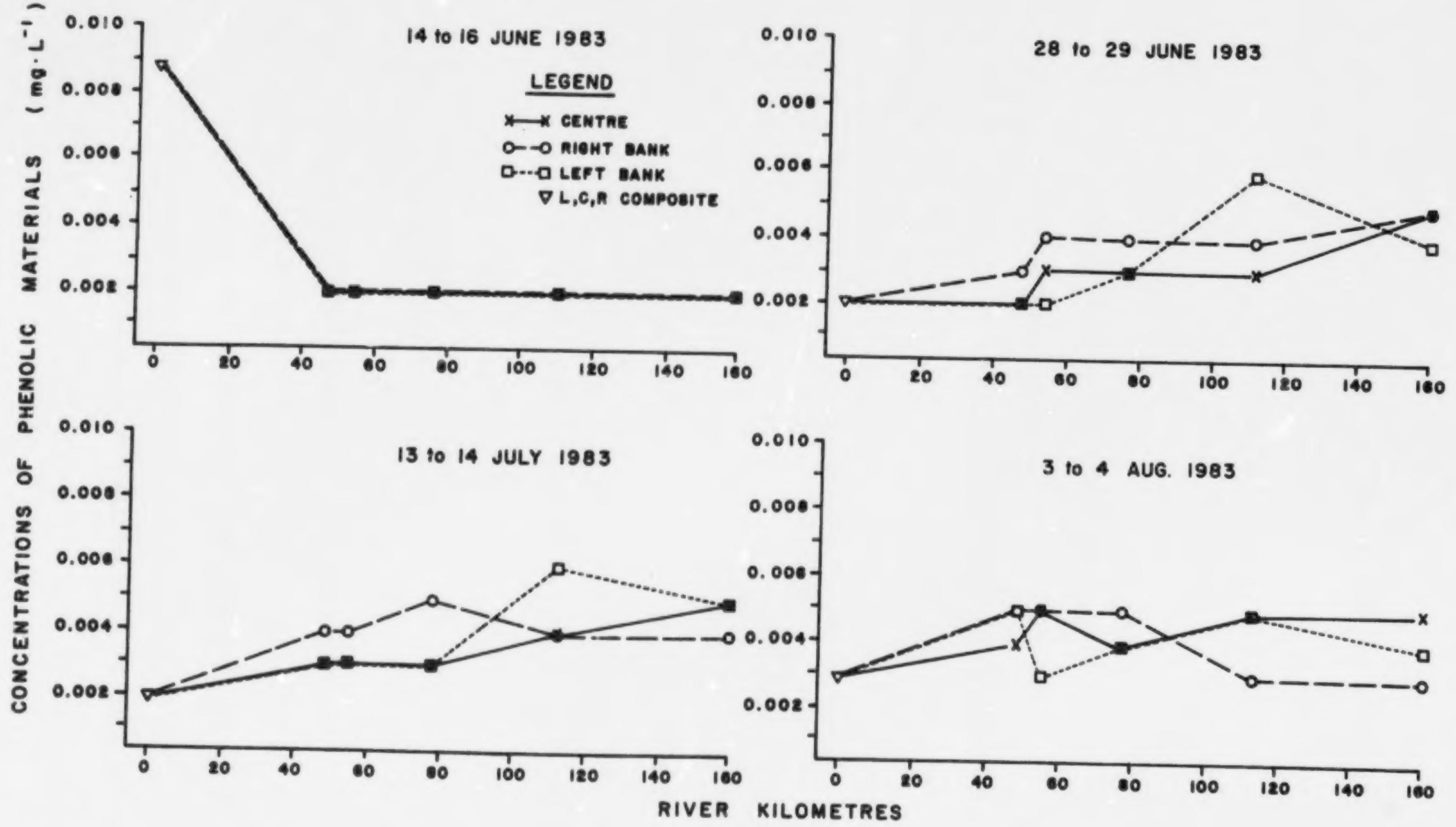


Fig. 10.3 Longitudinal variations in phenolic materials concentrations in the North Saskatchewan River for selected dates in 1983.

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

Analyses were carried out on the watr samples for sixty-one compounds comprising the acid and base/neutral fractions. There were two positive detections in each of the water samples from the Devon and Beverly Bridge locations. The Devon sample contained bis (2-ethylhexyl)-phthalate at a concentration between 0.0005 and 0.001 $mg \cdot L^{-1}$, and di-n-butylphthalate at a concentration between 0.0001 and 0.0005 $mg \cdot L^{-1}$. The same two compounds were present in the Beverly Bridge water samples at concentrations between 0.00001 and 0.0001 $mg \cdot L^{-1}$. The other 59 compounds from the acid and base/neutral fractions were not detected.

10.1.3.1 Sediment Phase

The acid and base/neutral fractions were also analyzed for in 11 transect sediment samples. The results summarized in Table 10.4 show that certain organic compounds (e.g., benzothiazole, pyrene, and hexadecanoic acid) occurred at some locations. Saturated straight-chain aliphatic hydrocarbons (C_{14} to C_{23}), in the concentration range 0.01 to 0.1 $mg \cdot g^{-1}$, and similar amounts (0.01 to 0.1 $mg \cdot g^{-1}$) of phthalic acid esters [e.g., bis (2-ethylhexyl) -phthalate, di-n-butylphthalate, and diethylphthalate] occurred at almost all locations. Branched aliphatic hydrocarbons (molecular weight 150 to 450 Daltons) were observed at various concentration ranges (10 to 470 $mg \cdot g^{-1}$); the higher values occurred at Beverly Bridge (left-bank site), Fort Saskatchewan (right-bank site) and Vinca (right-bank site).

TABLE 10.4 Concentrations of organic constituents in the North Saskatchewan River sediments, 5 - 6 October 1983.

CHEMICALS	OBSERVED CONCENTRATION RANGE $mg \cdot g^{-1}$ dry wt.	DEVON	50 STREET BRIDGE		BEVERLY BRIDGE		FT. SASKATCHEWAN		VINCA		PAKAH
			RIGHT	LEFT	RIGHT	LEFT	RIGHT	LEFT	RIGHT	LEFT	
RIGHT LEFT											
Elemental molecular sulphur (S_6,S_7,and/or S_8)	0.01 - 10.0	X	X	X	X			X	X		
Saturated straight chain aliphatic hydrocarbons (C_{14} to C_{23})	0.01 - 0.1	X	X	X	X	X	X		X		X
Saturated branched aliphatic hydrocarbons (M.W. 150 to 450)	10 - 45	X	X		X					X	X
	110 - 200			X				X			
	220 - 300						X		X		
	420 - 470					X					
Bis (2-ethylhexyl)	0.01 - 0.1		X	X	X		X		X	X	X
	0.1 - 0.5							X			
Di-n-butylphthalate	0.01 - 0.1	X	X		X		X			X	
Diethylphthalate	0.01 - 0.1				X						
Benzothiazole	0.01 - 0.1	X	X							X	
Pyrene	0.01 - 0.1		X				X				
Methyl hydroxy substitued polycyclic (M.W. 234)	0.1 - 0.5		X								
Hexadecanoic acid	0.01 - 0.1			X						X	
Methoxy disulphide substituted organic (M.W. 266)	0.01 - 0.1							X			

Analysis for elemental molecular sulphur (S_6, S_7, and/or S_8) was also carried out on the acid and base/neutral fractions, and sulphur was present in the concentration range 0.01 to 10.0 $mg \cdot g^{-1}$ in seven of eleven samples.

Sediments in the river concentrate some of the organic compounds. Whether an organic compound concentrates or not depends upon a number of factors, which may include the composition of the bottom sediment, sorption, biodegradation, bioaccumulation, and other factors.

10.2 Surface Water Quality Objectives

The Alberta Surface Water Quality Objectives (ASWQO) for pesticides, herbicides, and PCBs are not set out in absolute concentrations, whereas most other constituents covered in this report are. Instead, "to provide reasonably safe concentrations of these materials in receiving waters, an application shall not exceed 1/100 of the 48-hour Tl_m" (p. 6, Alberta Environment 1977). No detectable levels of these substances were found in the NSR in the course of this investigation. This does not prove that exceedences never occur, but it does indicate that exceedences are likely to be very uncommon.

An ASWQO criterion of 0.005 $mg \cdot L^{-1}$ has been set for "phenolics" (i.e. total phenolics), a designation which includes a great many different but related compounds. The level of total phenolics measured in NSR samples in the course of this study usually complied with the ASWQO. Because analyses were for total phenolics rather than for specific phenolic compounds, it is unwise to discuss criteria for domestic water supplies, criteria for the protection of aquatic life, potential taste and odor (organoleptic) properties, or other deleterious qualities which might be due to the presence of the low concentrations of specific phenolic compounds in the NSR. Even minute concentrations (i.e. levels well below the stated ASWQO) of certain phenolic compounds can impart a taste to water, an effect which may be intensified by chlorination.

Concentrations for purgeable priority pollutants and base/neutral fractions are not specified in the ASWQO. Most of these compounds were detected at or very little above trace levels; none was present at concentrations greater than 0.0002 $mg \cdot L^{-1}$, and most concentrations were less than 0.0001 $mg \cdot L^{-1}$.

No standards have yet been set or proposed for organics in river sediments.

10.3 Impacts

The presence of pesticides, herbicides, and PCBs at the levels detected in the NSR (i.e. below detection limits) is no cause for concern, even though some of these substances are known mutagens or suspected carcinogens. However, there is need for vigilance, because of the possible but unknown cumulative effects of even low concentrations of different organic compounds and because of the tendency of some to accumulate in the biota or in the sediments.

At the measured levels for phenolics in the NSR, impacts on the river biota are likely to be slight. Impacts on the quality of water intended for domestic use are likely to be mainly aesthetic (especially taste), although detailed analyses for specific compounds would be warranted before even low concentrations are dismissed as being insignificant.

The toxicity of phenolic compounds varies with the type, position, and number of substitutions on the parent molecule. Furthermore, it is widely believed that chlorinated phenolic compounds pose greater environmental hazards than phenol or other non-chlorinated phenolic compounds. Therefore, a proper assessment of the potential toxic effects of the phenolic compounds discharged into the NSR would require information on river mixing along certain sections of the river, constituent loading and dilution coefficients along these sections, and factors and conditions influencing the toxicities of phenolic compounds to various test organisms (Buikema, Jr., et al. 1979). The effects of many chemical toxicants, especially at low concentrations, are difficult to quantify and even more difficult to predict. Long-term exposure of organisms to specific toxicants at low concentrations may result in acclimation or increased resistance to short-term exposure to similar toxicants at higher concentrations.

The presence of acid and base/neutral fractions and purgeable priority pollutants at or near the detection limit suggests that at present these compounds are not a threat to NSR water users downstream of Edmonton. However, the known presence of these compounds in the aquatic environment and a lack of understanding of the consequences of this presence reinforces the need to minimize the quantities of these compounds which enter Alberta rivers.

As indicated earlier, little is known about potential environmental dangers due to the presence of acid and base/neutral fractions and purgeable priority pollutants at low concentrations over extended time periods. Therefore, comments must be reserved regarding environmental or health effects from trace amounts of organic substances in NSR bottom sediments.

11.0 NUTRIENTS: PHOSPHORUS AND NITROGEN

Elements and their compounds that are required in relatively large amounts for plant growth are called macronutrients, or simply "nutrients". The two nutrient groups most commonly limiting plant growth or production are compounds or "forms" of phosphorus and nitrogen. Consequently, increases in the concentrations of these two nutrient groups are the usual causes of eutrophication or increased fertility of rivers and lakes.

Eutrophication is the elevation of nutrient levels from all sources, both natural and cultural. Cultural eutrophication or "cultural enrichment" is the elevation of nutrient levels through pollution resulting from human activities (Odum 1971). Such enrichment, particularly by compounds of phosphorus and nitrogen, stimulates plant growth beyond natural levels; such excessive growth can be the cause of low oxygen levels (especially in summer at night or during winter), high turbidity, some taste and odor problems, and nuisance blooms of certain algal species.

The phosphorus in surface waters has both natural and anthropogenic sources, and it occurs in a number of forms. It occurs naturally from the weathering and leaching of apatite and igneous rocks, and from the decomposition of naturally occurring organic matter. Anthropogenic sources include effluents from municipal sewage treatment plants and industries, and surface drainage from agricultural and urban lands. For the 1982-1983 study, phosphorus was measured as total phosphorus (TP), which includes all forms of phosphorus present in the water, both organic and inorganic, dissolved and particulate.

Two techniques were used in total phosphorus analysis during this study. In 1982, analyses were based on Standard Methods (American Public Health Association _et al_. 1980), whereas in 1983, analyses were based on a semi-automated procedure (Crowther _et al_. 1978). In 1982, samples from selected NSR sites were split and analyzed separately to compare the two analytical techniques; results were tested statistically and showed no significant differences between techniques ($P < 0.05$, $N = 14$). For additional details on sampling and analysis for phosphorus, refer to general methods (Section 5.0).

Nitrogen occurs in several organic and inorganic forms in the aquatic environment. Natural sources include the fixation of atmospheric elemental nitrogen by certain bacteria and blue-green algae, precipitation, surface drainage, and groundwater. The main anthropogenic sources include effluents from municipal sewage treatment plants and industries, and surface drainage from agricultural and urban lands.

Analyses were conducted for four nitrogen forms during this study, grouped as follows:

Total Kjeldahl Nitrogen (TKN)
Ammonia Nitrogen (NH_3-N)
Nitrate + Nitrite Nitrogen (NO_3 + NO_2 - N)
Nitrite Nitrogen (NO_2-N)

The TKN analysis includes both organic and ammonia nitrogen. The organic component can be obtained by subtracting (NH_3-N) from (TKN). Ammonia nitrogen (NH_3-N) is the total of all nitrogen in the forms of ammonium hydroxide (NH_4OH), ammonium ion (NH_4^+) and ammonia (NH_3). An estimate of total nitrogen (TN) is obtained by adding (TKN) and (NO_3 + NO_2 -N). Analytical techniques used for these variables were less sensitive in 1982 than in 1983, and concentrations at upstream sites in 1982 were often below the detection limit of the technique employed. Therefore, nitrogen results are given for 1983 only. For additional details on sampling and analysis for nitrogen, refer to general methods (Section 5.0).

For reasons explained earlier in this report (Section 5.3), median values rather than mean values were used for comparing phosphorus and nitrogen data from different sites.

11.1 Results and Discussion: Total Phosphorus

Median values were determined for all TP data collected over the two-year study period for each of left-bank, centre-channel, and right-bank sites at each of the NSR locations except Devon and E.L.Smith, where composites of left-bank, right-bank, and centre-channel samples had been analyzed. Results are summarized in Figure 11.1.

Total phosphorus concentrations in the NSR during the study period varied spatially and seasonally. Spatial differences were evident between upstream and downstream locations and between

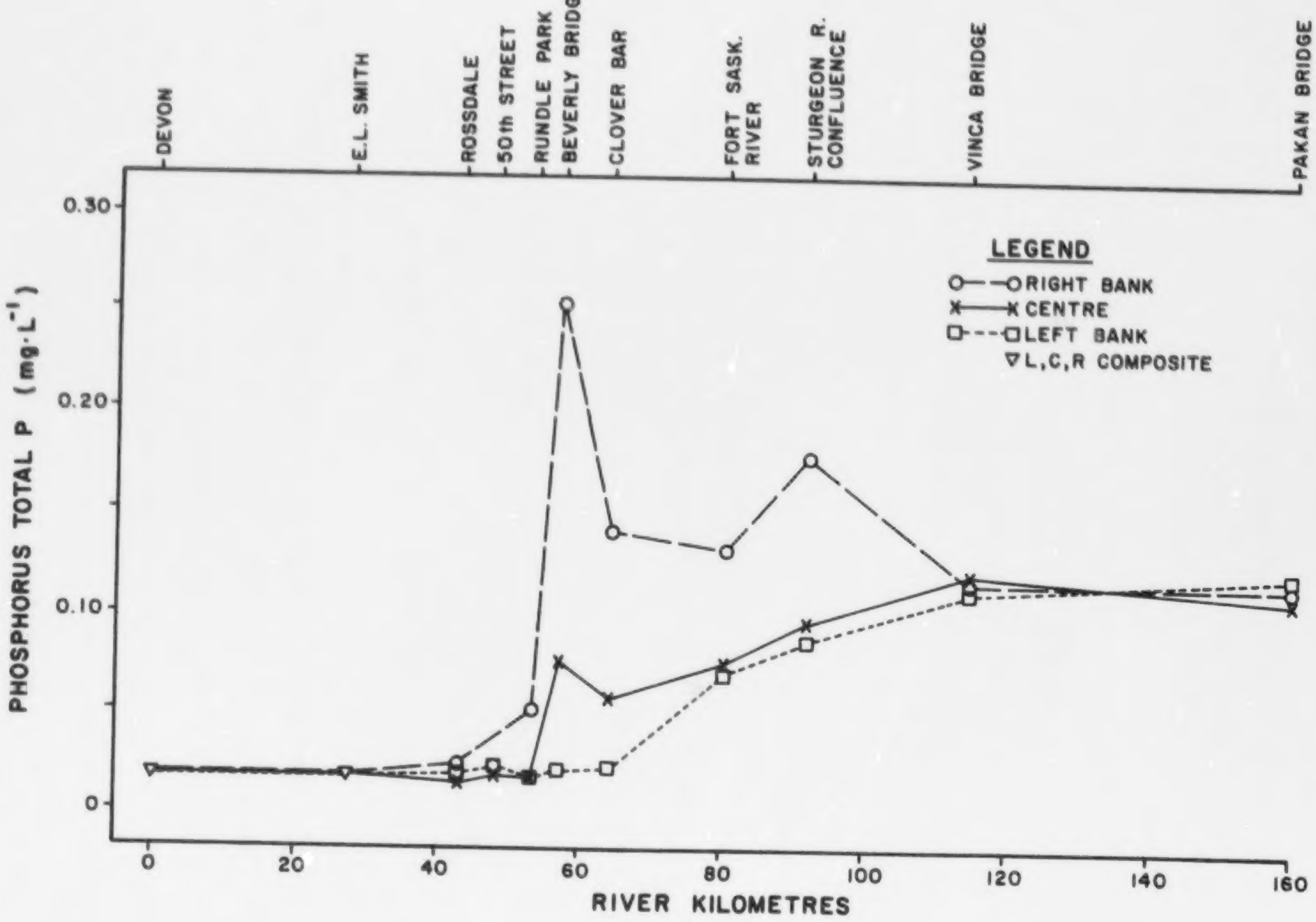


Fig. 11.1 Median total phosphorus values, NSR, 1982-1983.

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

left-bank and right-bank sites; seasonal variability in TP concentrations was apparent at certain sites, reflecting periods of high and low flow.

Median TP values for the four Devon to 50th Street locations ranged from 0.016 to 0.024 $mg \cdot L^{-1}$. These levels were comparatively low and the range indicates considerable site-to-site stability. From Rundle Footbridge to Sturgeon River, right-bank median values ranged from 0.051 to 0.254 $mg \cdot L^{-1}$, showing higher concentrations and greater longitudinal variability than corresponding left-bank (0.018 to 0.083 $mg \cdot L^{-1}$) or centre-channel (0.018 to 0.099 $mg \cdot L^{-1}$) median values. Median TP values for left-bank, centre-channel, and right-bank sites ranged from 0.112 to 0.122 $mg \cdot L^{-1}$ for Vinca and from 0.110 to 0.120 $mg \cdot L^{-1}$ for Pakan. There were significant differences between left-bank and right-bank values for Vinca, but not for Pakan ($P < 0.05$, $N = 20$). Median TP values are much higher downstream than upstream in the study section of the NSR, but site-to-site stability in TP values at Pakan is comparable to that of the Devon and E.L. Smith locations.

Figure 11.2 summarizes longitudinal differences between median TP values for left-bank and right-bank sites during periods of high flow (May to July) and low flow (August to March), based on the following summary of river discharges for all sampling dates from May 1982 to March 1984:

	May to July	August to March
Median ($m^3 \cdot s^{-1}$)	286	121
Range ($m^3 \cdot s^{-1}$)	(229 - 726)	(83 - 213)

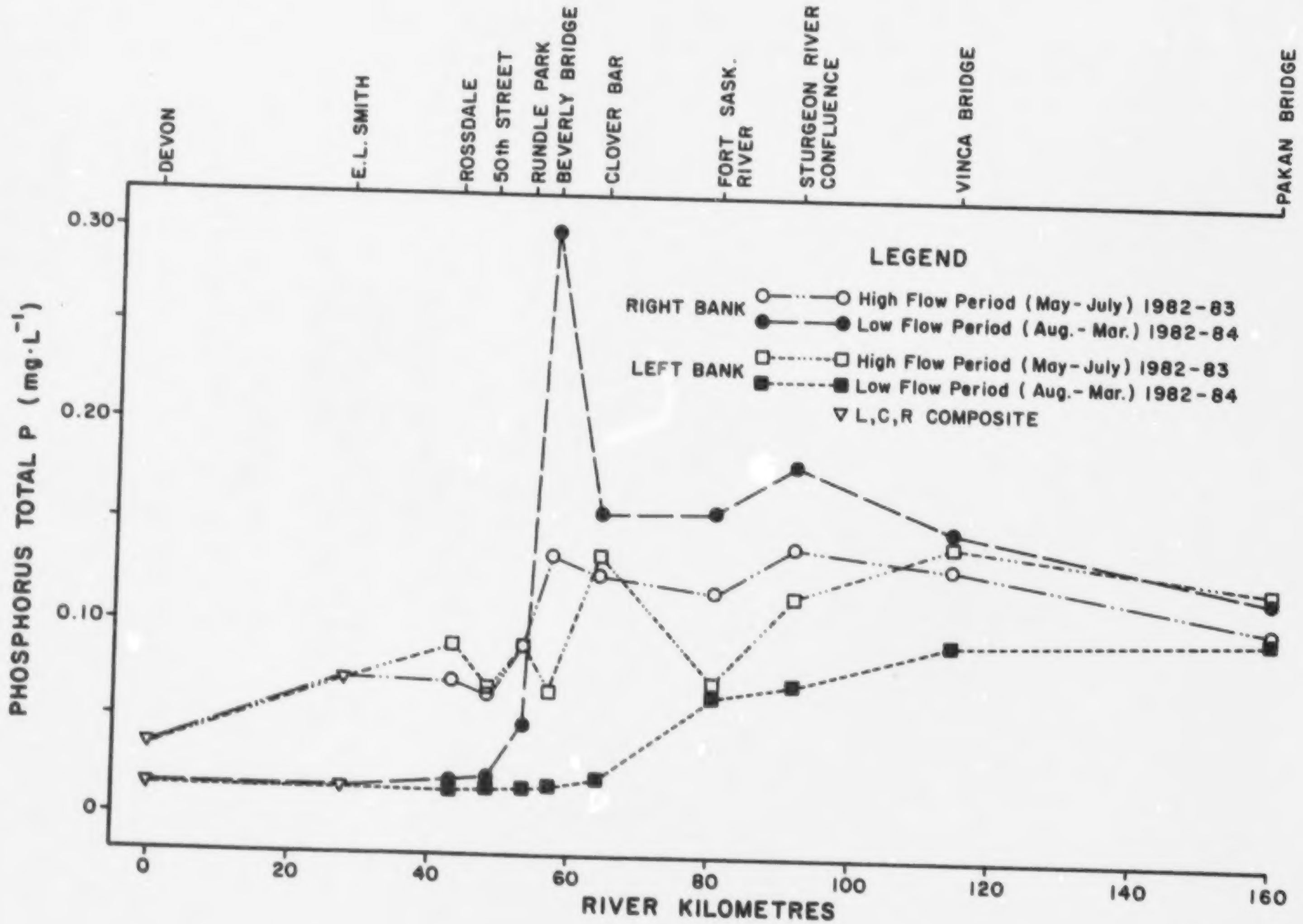


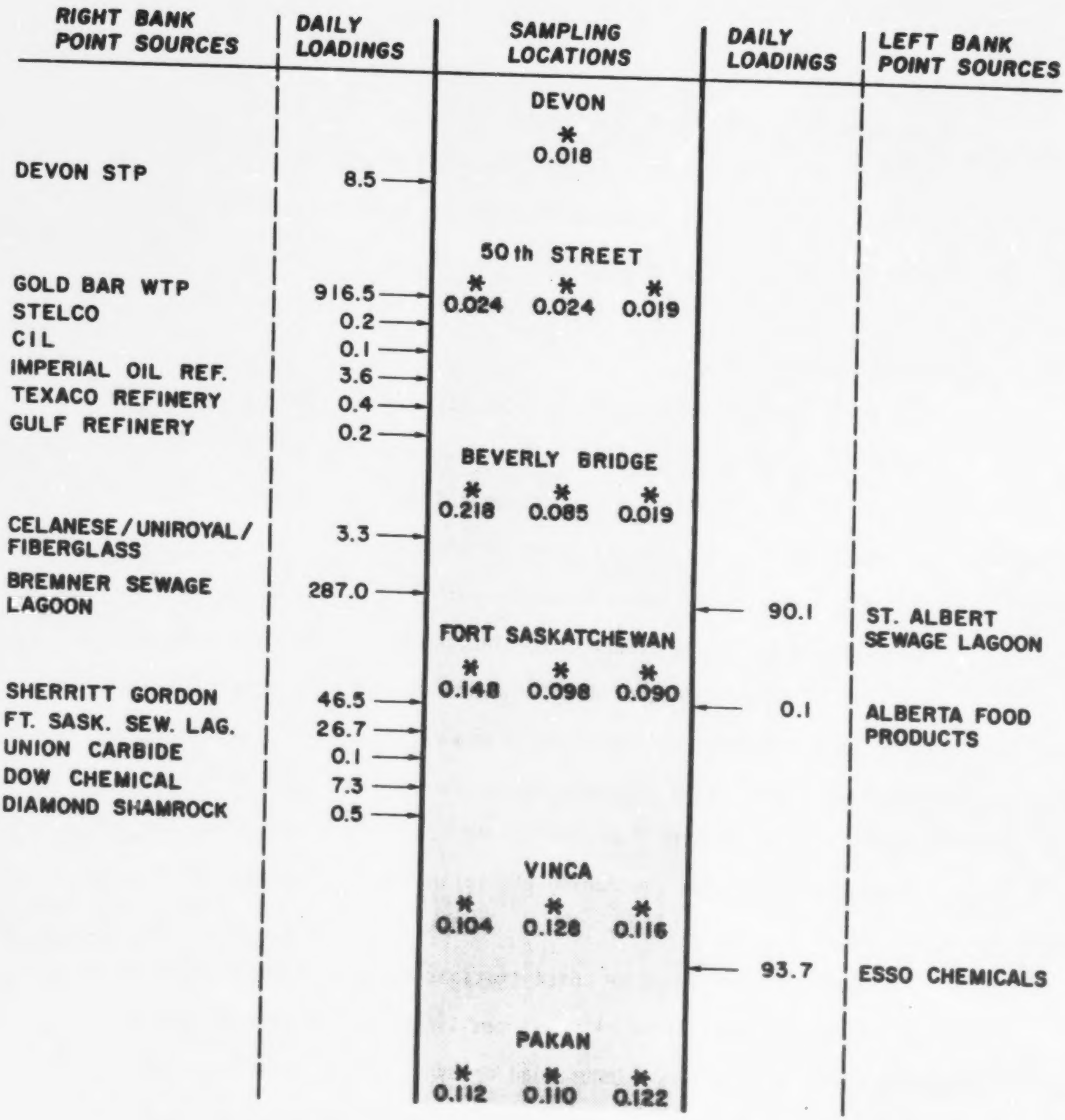
Fig. 11.2 Total phosphorus, NSR, 1982-1983 ; median left bank and right bank values for the study period.

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

From Devon to Rundle Footbridge, bank-to-bank differences in TP were usually small and the highest concentrations usually occurred during the high-flow period. Locations downstream of Rundle Footbridge showed greater bank-to-bank differences, but these differences tended to diminish in downstream direction.

The spatial variability in median TP values (bank-to-bank and upstream-downstream) in the NSR is attributable to point-source discharges high in TP entering the river. Figure 11.3 summarizes the estimates of loading to each bank of the NSR from continuous-effluent sources: municipal sewage treatment plants (M) and industries (I). Loads were calculated using the same methods as for major ions (Section 8.1).

Approximately 87% of all continuous point-source phosphorus discharge enters the NSR on the right bank between 50th Street Footbridge and Vinca. This is consistent with the higher concentrations measured in right-bank samples in this part of the study section of the NSR. The more gradual increase in TP concentrations in centre-channel samples and the absence of an increase in TP concentrations in left-bank samples until Fort Saskatchewan are probably a reflection of both the slow lateral mixing characteristics of the NSR and the smaller loads from left-bank point sources (Fig. 11.3). The small differences in the median TP concentrations among left-bank, right-bank, and centre-channel sites at Vinca and Pakan and the absence of major point-source discharges between these two locations suggests that the river is mixed at the downstream locations.


RIGHT BANK POINT SOURCES
DAILY LOADINGS
SAMPLING LOCATIONS
DAILY LOADINGS
LEFT BANK POINT SOURCES
DEVON
* 0.018
DEVON STP 8.5
50th STREET
* 0.024 * 0.024 * 0.019
GOLD BAR WTP 916.5
STELCO 0.2
CIL 0.1
IMPERIAL OIL REF. 3.6
TEXACO REFINERY 0.4
GULF REFINERY 0.2
BEVERLY BRIDGE
* 0.218 * 0.085 * 0.019
CELANESE/UNIROYAL/FIBERGLASS 3.3
BREMNER SEWAGE LAGOON 287.0
90.1 ST. ALBERT SEWAGE LAGOON
FORT SASKATCHEWAN
* 0.148 * 0.098 * 0.090
0.1 ALBERTA FOOD PRODUCTS
SHERRITT GORDON 46.5
FT. SASK. SEW. LAG. 26.7
UNION CARBIDE 0.1
DOW CHEMICAL 7.3
DIAMOND SHAMROCK 0.5
VINCA
* 0.104 * 0.128 * 0.116
93.7 ESSO CHEMICALS
PAKAN
* 0.112 * 0.110 * 0.122

TOTAL INDUSTRIAL LOAD = 156.0
TOTAL MUNICIPAL LOAD = 1328.8
TOTAL DAILY LOAD = 1484.8

Fig. 11.3 Diagrammatic representation of 1983-84 median T. Phosphorus concentrations ($mg \cdot L^{-1}$) and estimated municipal and industrial point source loadings ($kg \cdot d^{-1}$)

Alberta
ENVIRONMENT
Pollution Control Division

Loadings from intermittent point sources, such as tributary streams and storm sewers, were not included in the above summary, even though contributions from these sources are important during the period of spring runoff and heavy rains. Table 11.1 shows that during late June and early July, 1983, tributaries were a major source of TP loading to the NSR.

A mass-balance estimate suggests that more phosphorus entered the study section of the NSR than could be accounted for by the differences between the loads at Devon and Pakan. Because phosphorus is considered to be a non-conservative element, this deficit implies that there was some phosphorus uptake within this section of the NSR. Phosphorus taken up by potamo-phytoplankton would be included in the estimate of TP at Pakan; however, phosphorus taken up by epilithic and other attached algae and macrophytes would not. Much of the phosphorus taken up by attached plants during the period of active growth would be flushed from the system as they die off during the winter or are scoured out during the spring and early-summer high-flow periods.

Seasonal changes in TP concentrations appeared to be related to variations in river flow. At upstream locations, which were not influenced by continuous industrial or municipal point-source inputs (Devon to 50th Street), TP concentrations were consistently higher during periods of high flow (Fig. 11.2). The naturally high load of suspended sediments during this period (see Section 8.0) may have been the reason for these elevated concentrations. Major nutrient data

TABLE 11.1 Estimated Total Phosphorous and Total Nitrogen Loads (kg·d^{-1})
To North Saskatchewan River from Major Tributary Streams, 1983.

LOCATION:	WHITEMUD		STURGEON		REDWATER		BEAVERHILLS		TOTALS	
DATE	TP	TN	TP	TN	TP	TN	TP	TN	TP	TN
17/05	0.4	2.	18.7	218.	0.4	8.	-	-	19.5	228.
31/05	2.4	9.	14.1	189.	1.1	20.	-	-	17.6	218.
16/06	-	-	8.6	104.	11.1	25.	-	-	19.7	129.
28/06	1078.3	3437.	340.1	2391.	200.8	1248.	352.5	3819.	1971.7	10,895.
13/07	1076.8	3032.	419.1	2119.	151.0	847.	91.2	279.	1738.1	6277.
03/08	38.2	382.	-	1153.	23.5	174.	12.1	97.	73.8	1806.
23/08	-	-	15.4	311.	1.2	10.	-	1.	16.6	322.
21/09	-	-	4.3	108.	1.6	14.	-	2.	5.9	124.
17/11	-	-	-	39.	-	14.	-	1.	-	54.

TP = total phosphorus

TN = total nitrogen

from the Devon station of the Alberta Environment River Water Quality Monitoring Network during 1982-1983 show that higher TP concentrations occurred in association with high suspended sediments, measured as non-filterable residue (NFR):

	Total Phosphorus ($mg \cdot L^{-1}$)	Particulate Phosphorus ($mg \cdot L^{-1}$)	Dissolved Phosphorus ($mg \cdot L^{-1}$)	NFR ($mg \cdot L^{-1}$)
HIGH FLOW (May-July)	0.083	0.075	0.008	79.2
LOW FLOW (Aug.-Nov.)	0.016	0.012	0.004	10.3

Most of the measured total phosphorus was in particulate form.

Downstream locations, which received continuous point-source discharges of total phosphorus, showed greater differences in bank-to-bank TP concentrations during low-flow periods (Fig. 11.2). The smaller bank-to-bank differences found during high flow were probably due to dilution from lateral mixing, which was more rapid and thorough during high-flow periods because of greater turbulence, water volumes, and flow velocities at this time. Contributions from tributary streams on the left bank were usually greater during high flow and tended to reduce bank-to-bank differences.

11.2 Surface Water Quality Objectives: Phosphorus

The Alberta Surface Water Quality Objectives (ASWQO) recommend that total phosphorus not exceed 0.05 $mg \cdot L^{-1}$ (Alberta Environment 1977). Figure 11.4 is a diagrammatic representation of

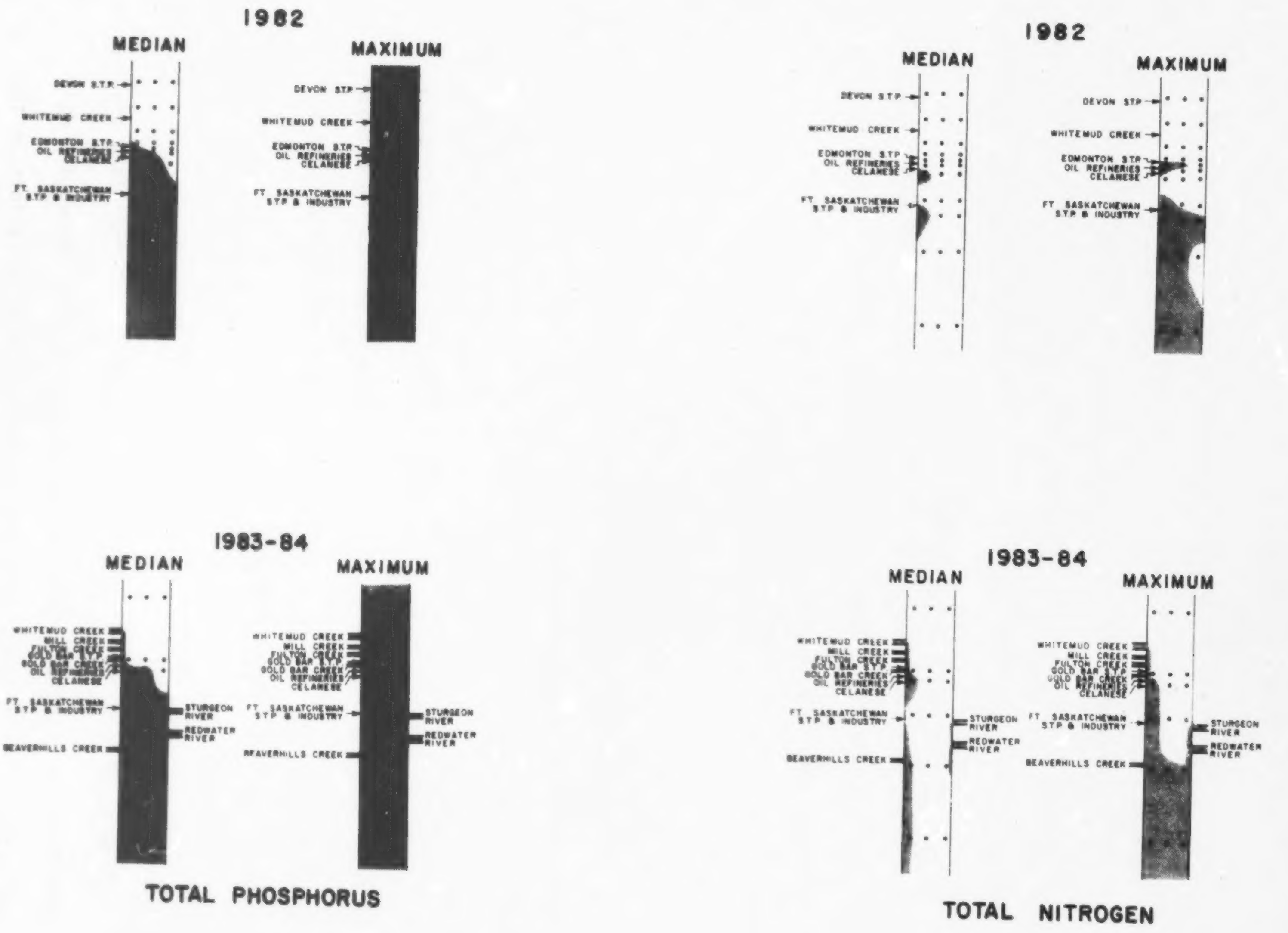

1982
MEDIAN
MAXIMUM
DEVON S.T.P.
WHITEMUD CREEK
EDMONTON S.T.P.
OIL REFINERIES
CELANESE
FT. SASKATCHEWAN S.T.P. & INDUSTRY
1983-84
MEDIAN
MAXIMUM
WHITEMUD CREEK
MILL CREEK
FULTON CREEK
GOLD BAR S.T.P.
GOLD BAR CREEK
OIL REFINERIES
CELANESE
FT. SASKATCHEWAN STP & INDUSTRY
BEAVERHILLS CREEK
STURGEON RIVER
REDWATER RIVER
TOTAL PHOSPHORUS
TOTAL NITROGEN

Fig. 11.4 River reaches in which nutrients exceeded Alberta surface water quality objectives.

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

the extent to which median and maximum TP concentrations in the NSR exceeded the 0.05 $mg \cdot L^{-1}$ objectives in 1982 and 1983.

Even though median TP concentrations at the upstream sites did not exceed the ASWQO, about 20% of individual samples in 1983-1984 and about 30% in 1982 had concentrations greater than the objectives. Concentrations greater than the objectives at upstream locations occurred mainly during high-flow conditions because of the naturally high suspended sediment load. Most of the total phosphorus at this time was particulate (see Section 11.1) and probably of apatite origin. Therefore, it was unlikely that most TP was in a form that was biologically available (McNeely et al. 1979).

At downstream sites, the objectives were exceeded in 85% of the samples in 1982, and 95% of the samples in 1983. Many of the sites where TP concentrations exceeded objectives were close to effluent outfalls, where guidelines do not apply (see Section 5.4). At Pakan, however, where mixing is believed to be complete most of the time, objectives were exceeded in 90 to 95% of the samples. Long-term data from the Pakan station of the River Water Quality Monitoring Network indicate that most of the TP at this location was in the dissolved fraction and was likely biologically available.

11.3 Impacts: Phosphorus

The many forms or "species" of phosphorus which occur in surface waters are not commonly toxic to man or aquatic life (McKee and Wolf 1963), but certain forms are known to be key limiting factors in the growth of aquatic plants. When sufficient nitrogen is present in the water, biologically available phosphorus at concentrations near 0.1 mg·L^{-1} may be the cause of nuisance growths of macrophytes, certain algae, or slimes (McNeely et al. 1979).

Although extensive macrophyte growth has not been a problem in past years, the potential for nuisance growths of macrophytes could be realized if current nutrient levels (especially phosphorus) persist in combination with certain other conditions, such as low river flows (contributing to increased water clarity and higher temperatures) and low spring runoff (reducing scouring). These relationships are discussed at greater length in Sections 12.3 and 16.0.

11.4 Results and Discussion: Nitrogen

In general, the spatial distribution of nitrogen forms in the study section of the NSR in 1983-1984 was comparable to that described above for total phosphorus during the same period (Figs. 11.5, 11.6, 11.7). Median concentrations of all three forms (TKN, NH_3-N, and NO_3 + NO_2-N) were lowest at the Devon and 50th Street Footbridge locations. Bank-to-bank differences in all three forms were not significant at the 50th Street Footbridge ($P< 0.05$, $n = 12$). From the Beverly Bridge location through to Vinca, right-bank samples had consistently higher concentrations of all three forms of nitrogen than the corresponding centre-channel or left-bank samples. However, concentrations at centre-channel and left-bank sites increased gradually, reaching highest levels at Vinca or Pakan. Although

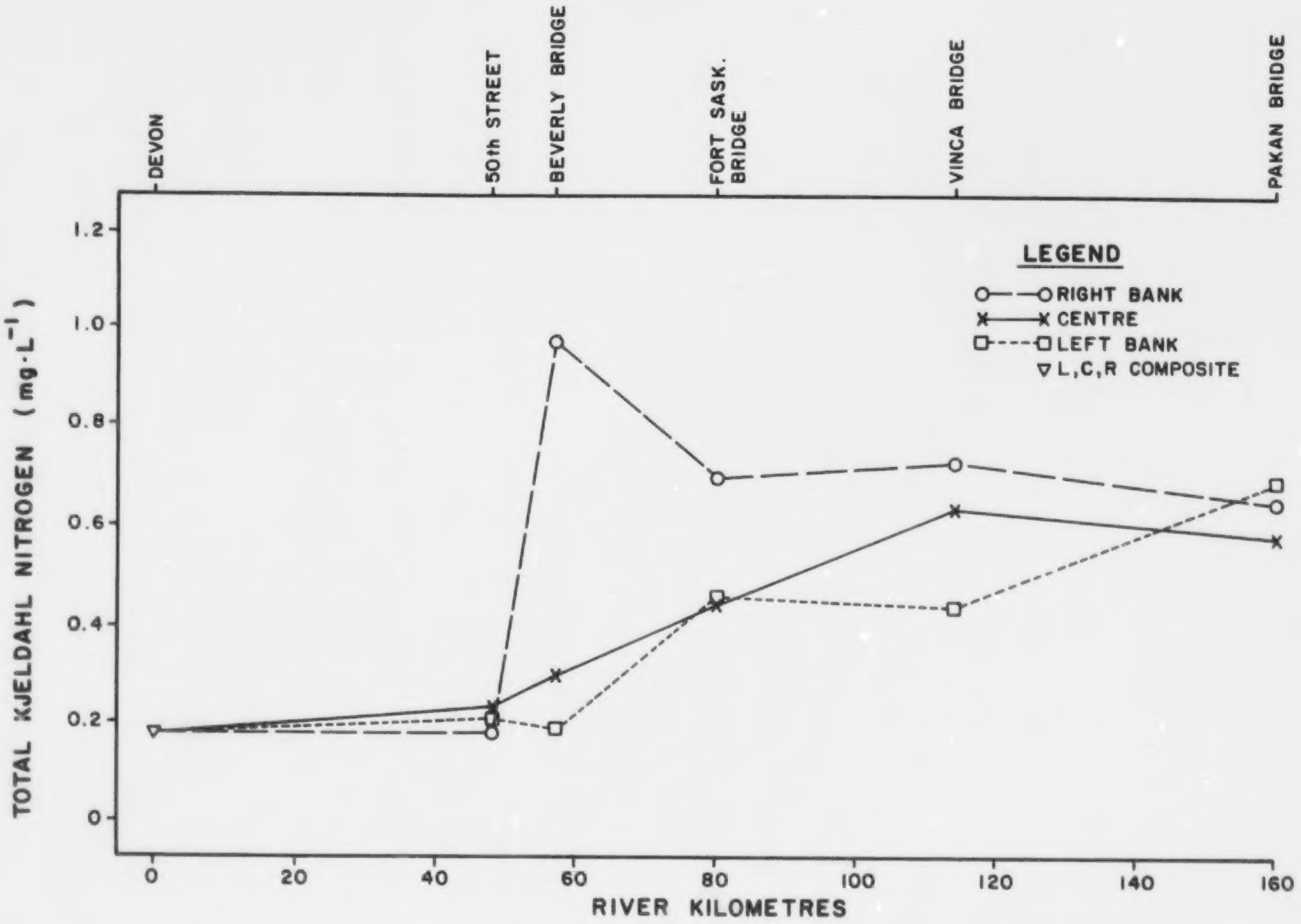


Fig. 11.5 Median Total Kjeldahl nitrogen values, North Saskatchewan River, 1983 - 1984.

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

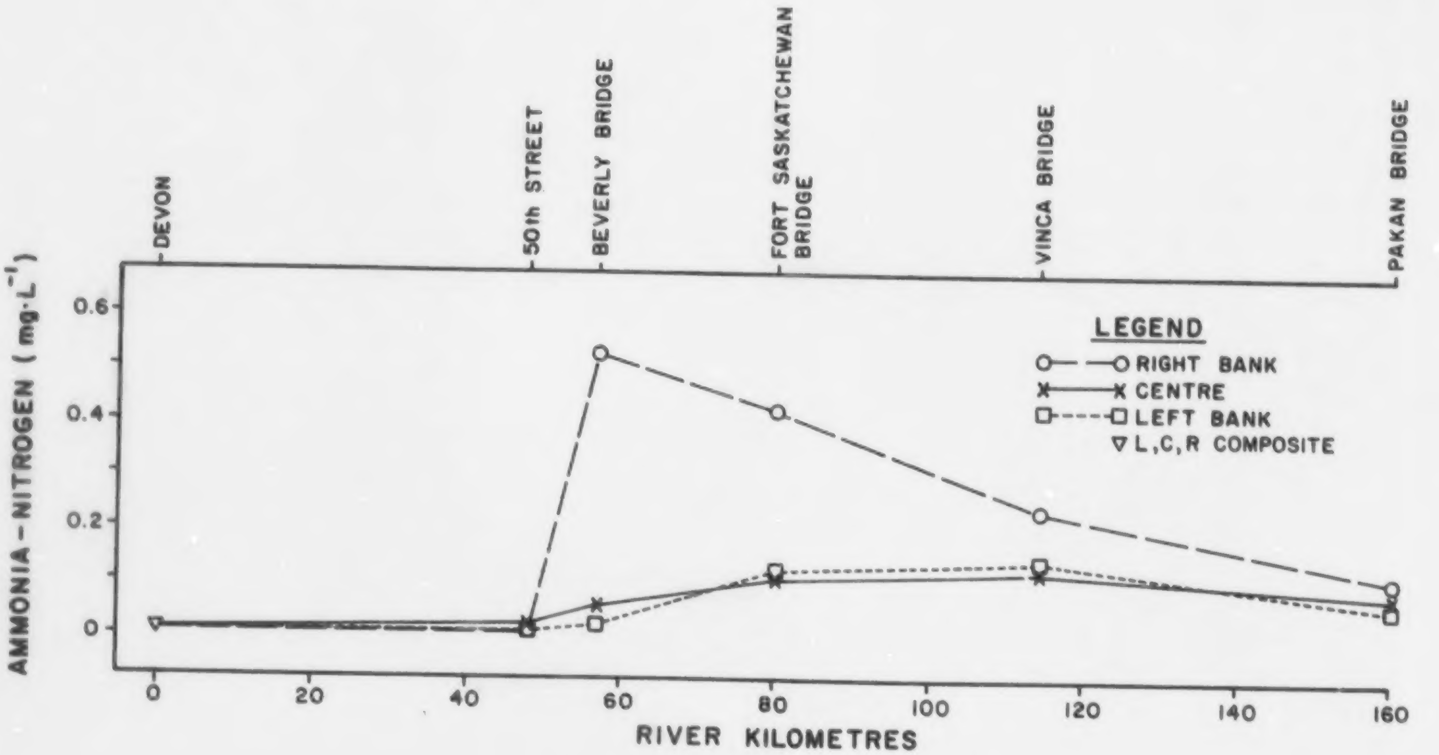


Fig. II.6 Median ammonia - nitrogen values , North Saskatchewan River , 1983 - 1984 .

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

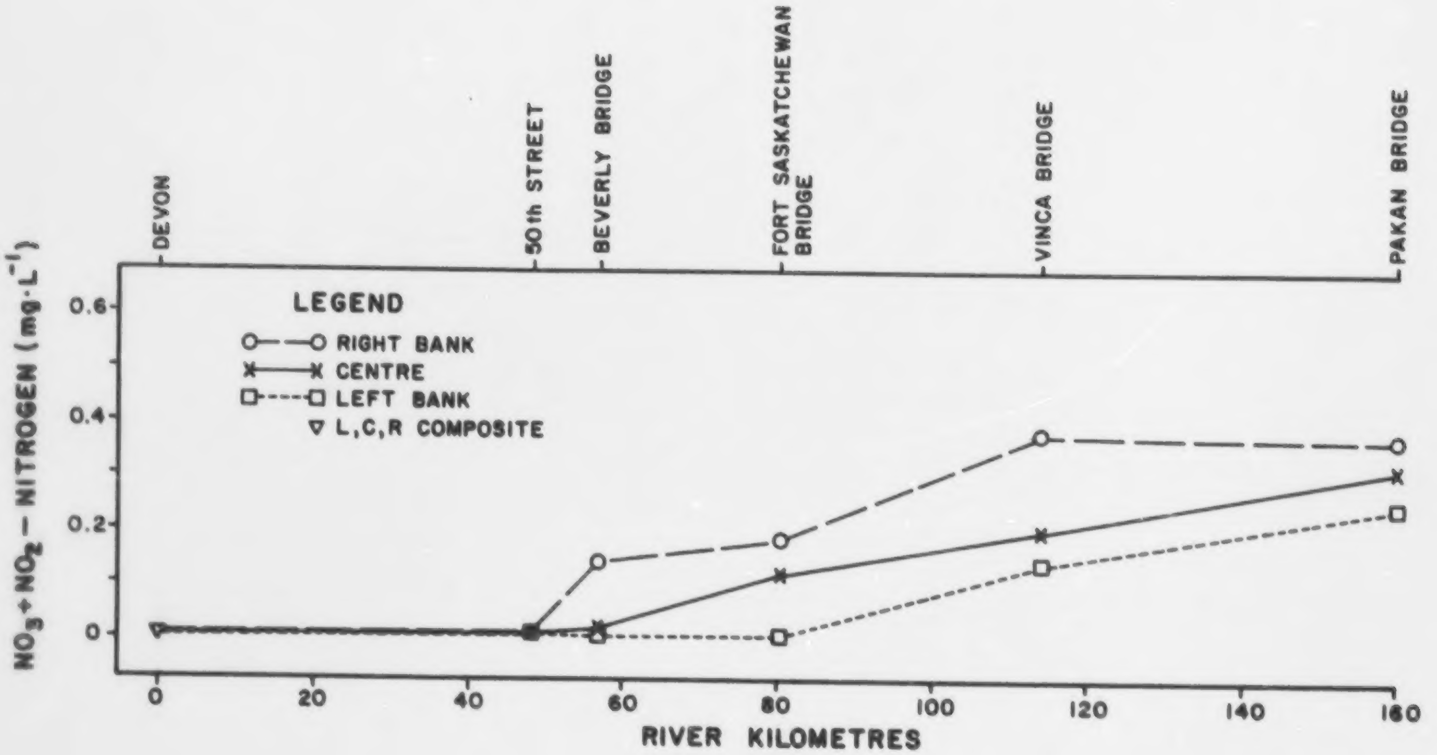


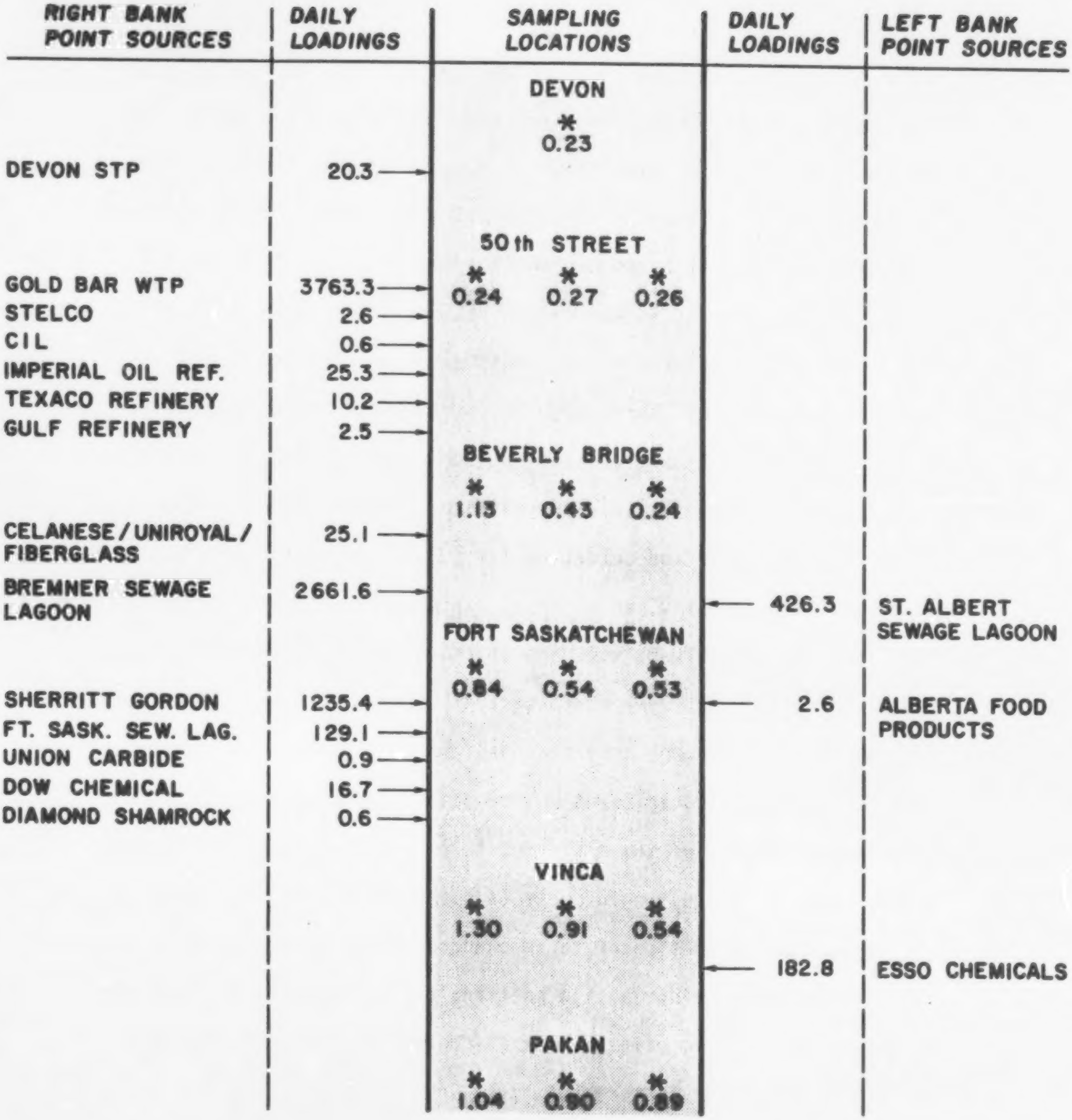
Fig. 11.7 Median nitrate plus nitrite – nitrogen values, North Saskatchewan River, 1983-1984.

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

bank-to-bank differences were significant at Pakan ($P< 0.05$, $n = 11$), they were much smaller than those at Beverly Bridge, Fort Saskatchewan, or Vinca. Overall concentrations of all three forms of nitrogen were comparatively high at Pakan during 1983-1984.

Seasonal patterns in the concentrations of nitrogen forms were less clear than spatial patterns. Highest levels of TKN and NH_3-N occurred at Devon, all three 50th Street Footbridge sites, and Beverly Bridge left-bank and centre sites in late June and mid-July of 1983 when flows were highest. Nitrate+nitrite concentrations at these sites were less than the detection limits of 0.05 $mg\cdot L^{-1}$ on almost all occasions; consequently, no seasonal pattern was evident. At the Beverly Bridge right-bank site and at all sites downstream from Beverly Bridge, there were no consistent seasonal patterns of nitrogen concentration. Although some seasonal and spatial changes in the distribution of nitrogen forms may be attributable to the interconvertibility of the different forms as shown in the processes and pathways of the nitrogen cycle (e.g. see Odum 1971 or McNeely *et al*. 1979), an explanation of these changes will not be attempted here. The spatial distribution patterns of nitrogen forms in the NSR primarily result from point-source discharges of nitrogen, and major trends are discussed in terms of "total nitrogen" (Fig. 11.8).

Approximately 92% of all total nitrogen from continuous municipal and industrial point-source discharges enters the NSR on the right bank between the 50th Street Footbridge and Vinca. This is evident in the substantially higher total nitrogen concentrations measured at right-bank sites below the 50th Street Footbridge (Fig. 11.8). The


RIGHT BANK POINT SOURCES
DAILY LOADINGS
SAMPLING LOCATIONS
DAILY LOADINGS
LEFT BANK POINT SOURCES
DEVON
*
0.23
DEVON STP
20.3
50th STREET
* * *
0.24 0.27 0.26
GOLD BAR WTP
3763.3
STELCO
2.6
CIL
0.6
IMPERIAL OIL REF.
25.3
TEXACO REFINERY
10.2
GULF REFINERY
2.5
BEVERLY BRIDGE
* * *
1.13 0.43 0.24
CELANESE / UNIROYAL / FIBERGLASS
25.1
BREMNER SEWAGE LAGOON
2661.6
426.3
ST. ALBERT SEWAGE LAGOON
FORT SASKATCHEWAN
* * *
0.84 0.54 0.53
SHERRITT GORDON
1235.4
2.6
ALBERTA FOOD PRODUCTS
FT. SASK. SEW. LAG.
129.1
UNION CARBIDE
0.9
DOW CHEMICAL
16.7
DIAMOND SHAMROCK
0.6
VINCA
* * *
1.30 0.91 0.54
182.8
ESSO CHEMICALS
PAKAN
* * *
1.04 0.90 0.89

TOTAL INDUSTRIAL LOAD = 1505.3
TOTAL MUNICIPAL LOAD = 7000.6
TOTAL DAILY LOAD = 8505.9

Fig. 11.8 Diagrammatic representation of 1983-84 median T. Nitrogen concentrations ($mg \cdot L^{-1}$) and estimated municipal and industrial point source loadings ($kg \cdot d^{-1}$) .

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

more gradual increases in centre-channel and left-bank levels in the same region probably reflect both the slowness of lateral mixing and the smaller left-bank nitrogen loading, a pattern rather similar to that noted for total phosphorus. Excluded from the summary in Figure 11.8 are the estimates from intermittent or highly fluctuating point-source discharges, such as tributary streams.

Contributions from tributaries can be important during high-flow periods, especially from late June to mid-July. Table 11.1 includes an overview of the seasonal nature of total nitrogen loading from tributary sources calculated from data gathered in 1983. These tributaries accounted for 42% to 56% of total nitrogen loading from all sources during the late June to mid-July interval. Some of the seasonal variation in total nitrogen noted at the 50th Street Footbridge sites and Beverly Bridge left-bank and centre-channel sites, which were upstream from major continuous left-bank point-source inputs, was due in part to total nitrogen contributions from Whitemud Creek and other smaller tributaries such as Mill and Fulton creeks.

11.5 Surface Water Quality Objectives: Nitrogen

The Alberta Surface Water Quality Objectives (ASWQO) recommend a maximum total nitrogen concentration of 1.0 $mg \cdot L^{-1}$ in surface waters (Alberta Environment 1977). The Canadian Drinking Water Standards and Objectives (Department of National Health and Welfare 1969) recommend maximum concentrations of 0.5 mg·L^{-1} for NH_3-N and 10 mg·L^{-1} for NO_3-N + NO_2-N for the protection of domestic water supplies.

The toxicity of aqueous solutions of ammonia to fish and certain aquatic invertebrates has been attributed to un-ionized ammonia (Environmental Studies Board 1973). The concentration of un-ionized ammonia is dependent upon the concentration of dissociated ammonia (NH_4), pH, dissolved oxygen, and temperature; it can be calculated when these other values are known (Environmental Protection Agency 1976). Levels of un-ionized ammonia actually toxic to freshwater animal life range from 0.20 to 2.0 mg ·L^{-1}; therefore, a maximum concentration of 0.02 mg·L^{-1} un-ionized ammonia should be complied with in order to protect freshwater life (Environmental Studies Board 1973).

Median and maximum total nitrogen concentrations in the study section of the NSR in 1983 are summarized in Figure 11.4. The ASWQO of 1.0 mg·L^{-1} was exceeded primarily at right-bank sites in the vicinity of major effluent contributions and at the three most downstream sampling locations (Sturgeon River, Vinca and Pakan). At Pakan, the objective was exceeded in approximately 24% of the samples collected during 1983.

In 1983, the Environmental Studies Board (1973) objective of 0.02 mg·L^{-1} of un-ionized ammonia was exceeded three times at the Beverly Bridge right-bank site (0.02, 0.03, and 0.04 mg·L^{-1}) and three times at the Sturgeon River right-bank site (0.02, 0.02, and 0.03 mg·L^{-1}).

The objective was exceeded once in 1983 at the Beverly Bridge right-bank site (0.03 $mg \cdot L^{-1}$). In each of these cases, dissolved oxygen was at or near 100% saturation, so it was unlikely that there was any toxic effect on fish or aquatic invertebrates at that time.

During 1983, the Canadian Drinking Water Standards (Department of National Health and Welfare 1969) objective of 0.5 $mg \cdot L^{-1} NH_4$-N for domestic water supplies was occasionally exceeded at the Beverly Bridge right-bank site and locations further downstream. At Pakan during this period, NH_4-N levels exceeded this objective in 12% of the samples. No objective for NH_3-N is included in the revised guidelines for Canadian Drinking Water Quality (Department of National Health and Welfare 1979).

Nitrate+nitrite nitrogen concentrations in excess of the Guidelines for Canadian Drinking Water Quality objective of 10 $mg \cdot L^{-1}$ were not measured in 1983.

11.6 Impacts: Nitrogen

High concentrations of nitrite-nitrogen (NO_2-N > 1.0 $mg \cdot L^{-1}$) can be toxic to man and other animals, and concentrations of nitrate-nitrogen (NO_3-N > 10 $mg \cdot L^{-1}$) can interfere with the oxygen-carrying capacity of the blood. Adherence to the surface water quality objective of 1.0 $mg \cdot L^{-1}$ total nitrogen (TN) would assure that neither of these forms reaches toxic levels.

As discussed above, high concentrations of ammonia-nitrogen (NH_3-N) can be lethal to fish and other forms of aquatic life. For this reason, the surface water quality objective for NH_3-N is usually lower than, and set separately from, that for TN.

All forms of nitrogen occurring in surface waters contribute to the fertility of the water, especially in the presence of adequate concentrations of available phosphorus. Excessive plant growth can occur when neither nitrogen nor phosphorus is limiting and other conditions are favourable. These relationships are discussed at more length in Sections 12.3 and 16.0.

12.0 CHLOROPHYLL-a

Most oxygen-evolving photosynthetic organisms have chlorophyll-a (chl-a) as a primary photosynthetic pigment. Because there is a direct relationship between the pigment concentration and the amount of cellular matter in plants, the chl-a concentration can be used as a relative measure of algal biomass or algal standing stock (e.g. Tett *et al*. 1978). By implication, chl-a concentrations are frequently synonymized with algal biomass or algal standing stock in published literature (e.g. Charlton *et al*. 1981).

In this study of the North Saskatchewan River (NSR), chl-a was measured for both the river phytoplankton (potamo-phytoplankton) and the epilithic algae. The latter are those algae attached to rocks in the river bed. The origin of potamo-phytoplankton in rivers is a controversial issue which has been discussed by Hynes (1972) and Whitton (1975). The general concensus is that most of the potamo-phytoplankton comes from benthic assemblies (including epilithic forms), and that another sizable fraction is due to inocula from lakes, backwaters, or slowly moving areas of a river. True planktonic species, which can only maintain populations in slowly moving waters, comprise a small fraction of the potamo-phytoplankton.

All sampling for chl-a was done in 1983 (see Table 4.5). For details of field and laboratory methods, see Section 5.0.

12.1 Potamo-phytoplankton: Results

The median potamo-phytoplankton biomass, measured as chl-a, increased consistently and significantly ($P<0.05$) throughout the 163-km study section of the NSR. Median chl-a concentrations at Pakan were 6 to 7 times higher than concentrations at Devon (Fig. 12.1). Although left-bank and centre-channel concentrations increased rather uniformly throughout the study section, right-bank values increased dramatically from 50th Street Footbridge to Beverly Bridge, and remained significantly higher at Fort Saskatchewan. Intersite differences diminished between the Vinca and Pakan locations.

Longitudinal differences in the chl-a concentrations were more pronounced during a low-flow period in the summer than during a similar low-flow period in the fall or during the spring-peak discharge:

	Devon	Pakan		Increase
	Composite	left	right	
	mg.m^{-3}	mg.m^{-3}	mg.m^{-3}	
Summer (Aug 2-3)	1.53	29.28	22.26	15 to 19x
Fall (Nov. 15-16)	0.57	6.10	5.14	9 to 11x
Spring (June 28-29)	2.53	3.72	2.18	0.9 to 1.5x

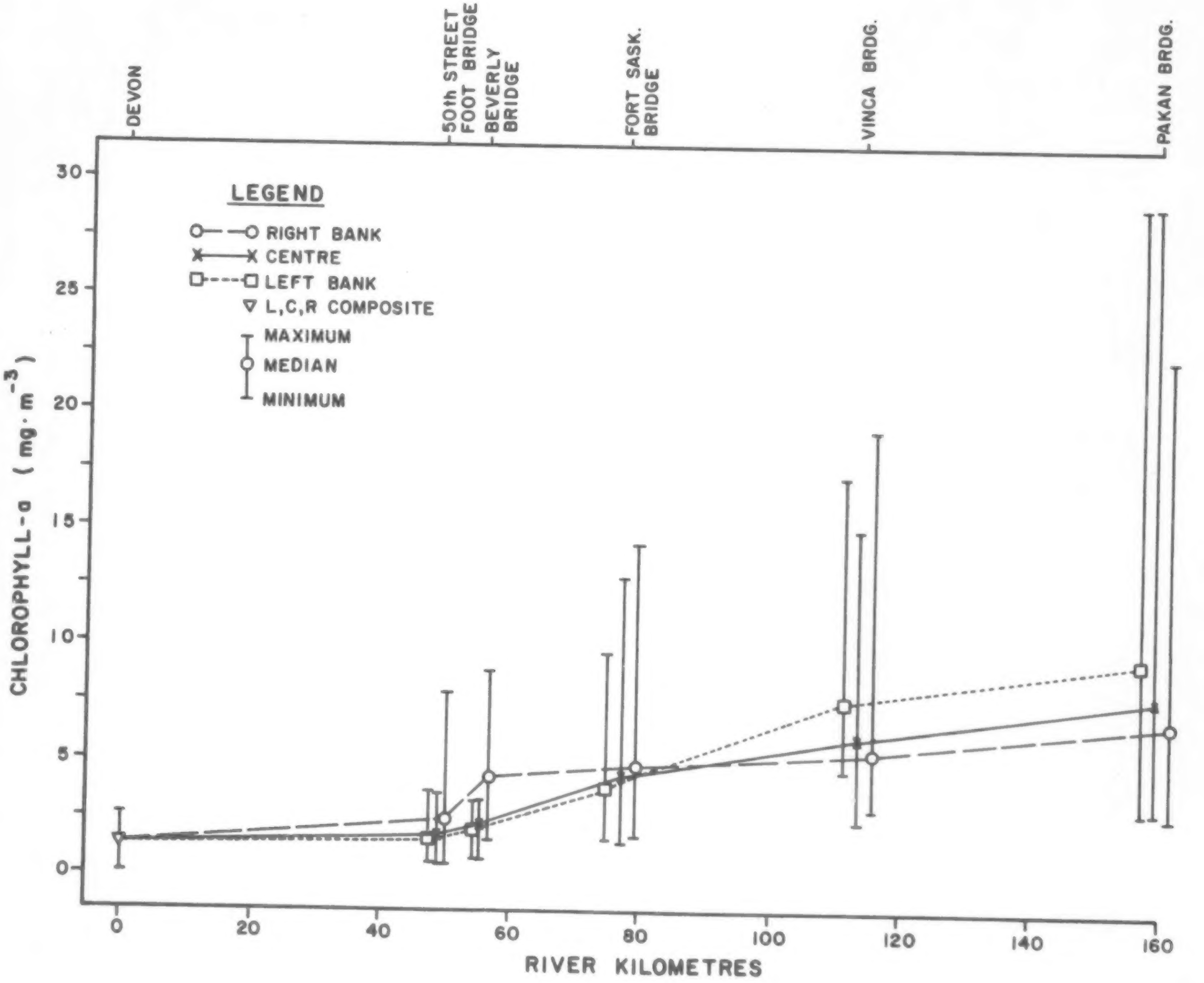


Fig. 12.1 Longitudinal trends in potamo-phytoplankton chlorophyll-a concentration of the North Saskatchewan River in 1983.

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

Except at Devon, where potamo-phytoplankton chl-a concentrations were always low and where no clear pattern was evident, there was a trend throughout the study section of the NSR towards seasonal peaks in chl-a concentration. The largest peak occurred in mid-summer (usually early August); an intermediate peak occurred in spring (late May to early June); a smaller peak was evident in late fall. These peaks tended to increase in size in downstream direction and were usually separated by low concentrations of chl-a, especially in mid-June during the period of high flow. This pattern of seasonal change was most evident for right-bank sites, an overview of which is shown in Figure 12.2.

12.2 Epilithic Algae: Results

The longitudinal pattern of epilithic chl-a concentration in the study section of the NSR was similar to that of potamo-phytoplankton chl-a. The median epilithic chl-a concentration was 8 to 9 times higher at Pakan than at Devon (Fig. 12.3). However, the pattern followed by epilithic chl-a was frequently inconsistent from one sampling date to the next, obscuring trends and suggesting considerable spatial or temporal variability.

The increase in chl-a concentrations was not statistically significant ($P<0.05$, $n = 9$) between Devon and 50th Street Footbridge for either right-bank or left-bank samples. Although the medians were more than twice as high at 50th Street Footbridge, the ranges of values and inconsistencies were much greater at 50th Street Footbridge

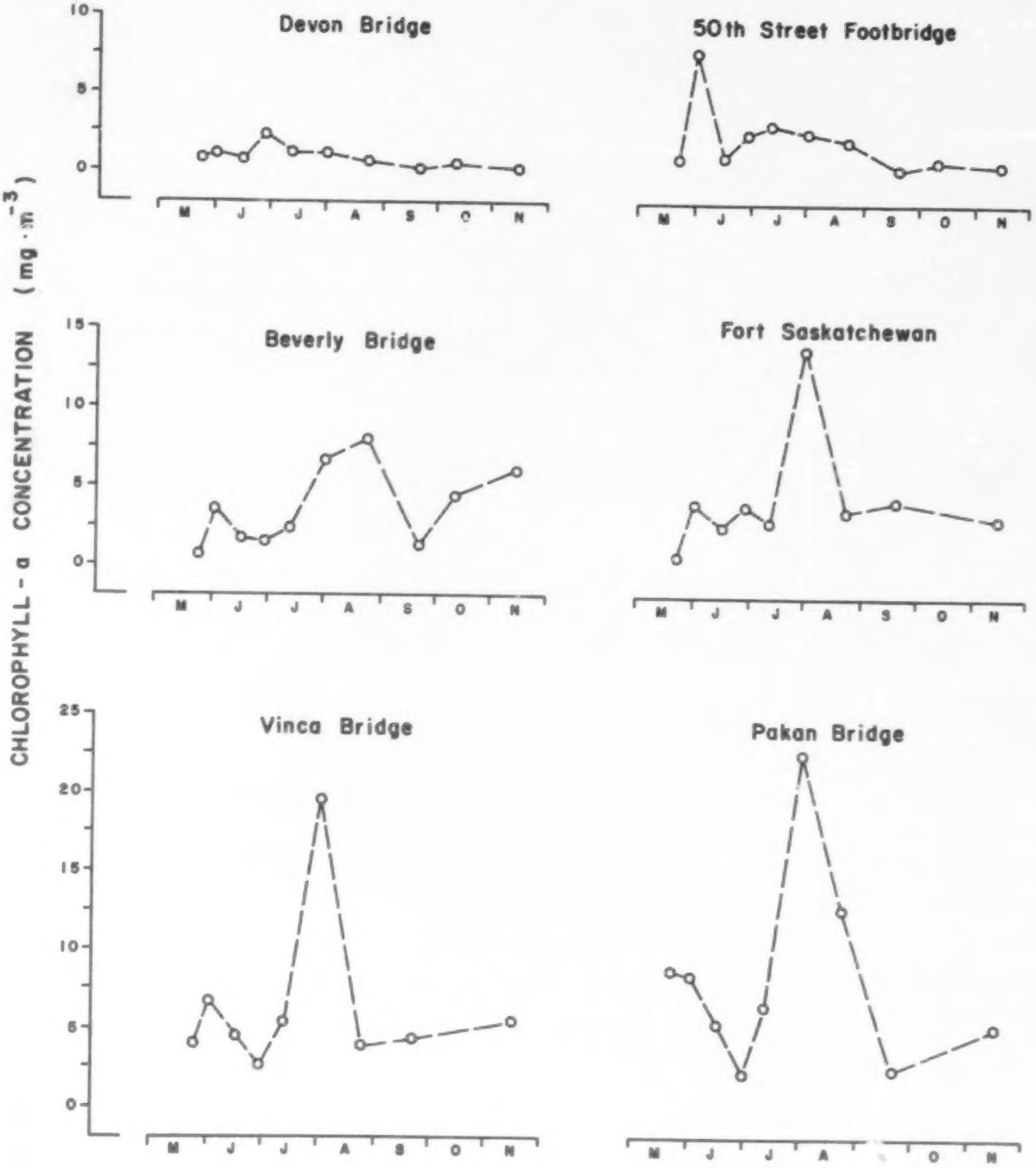


Fig. 12.2 Seasonal pattern of potamo-phytoplankton chlorophyll-a concentration at right bank sites of the North Saskatchewan River in 1983.

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

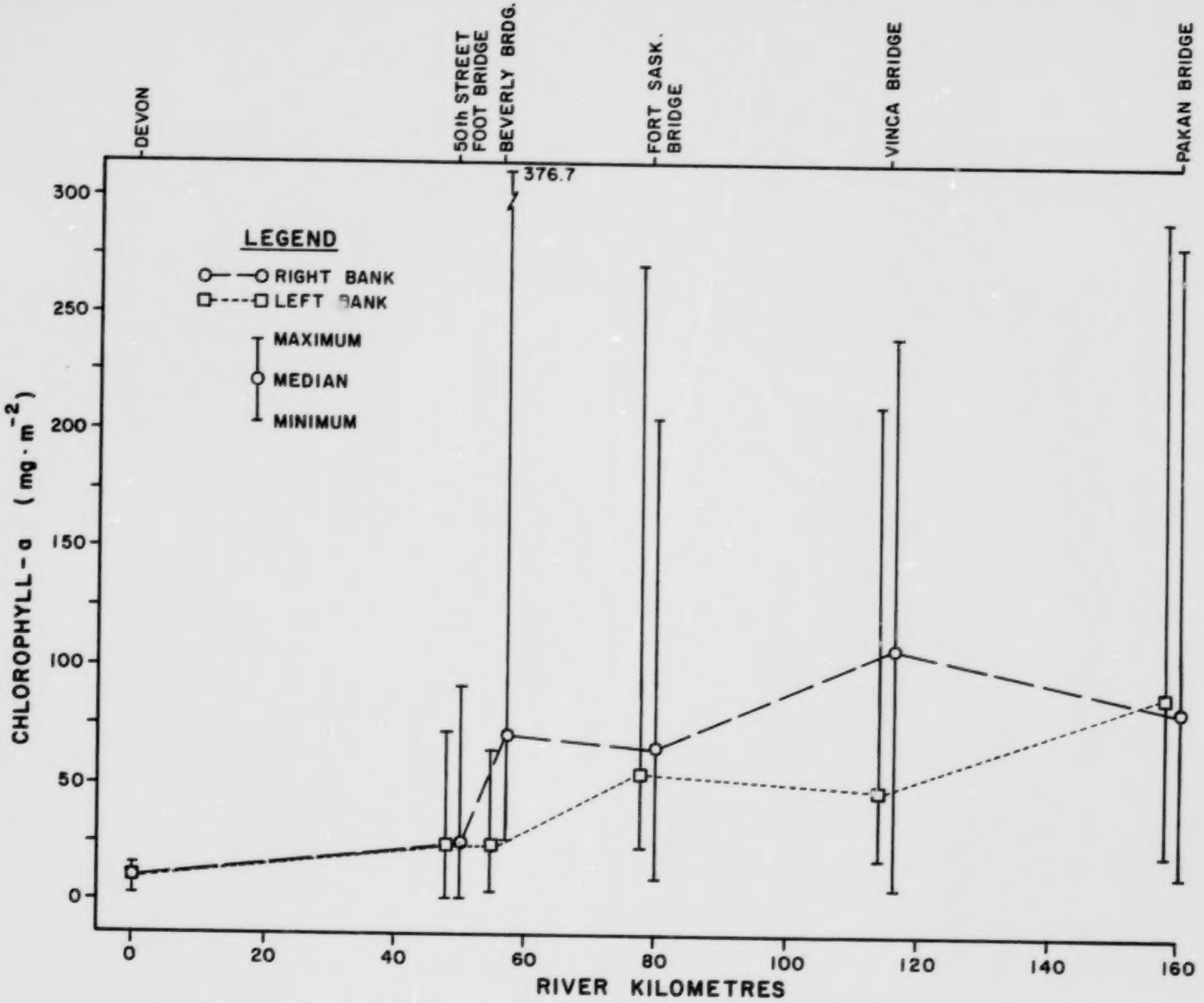


Fig. 12.3 Longitudinal trends in epilithic chlorophyll-a concentration of the North Saskatchewan River in 1983.

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

than at Devon. The first significant increase occurred between 50th Street Footbridge and Beverly Bridge on the right bank, and between Beverly Bridge and Fort Saskatchewan on the left bank ($P<0.05$, $n = 9$). Concentrations of epilithic chl-a were fairly constant from Fort Saskatchewan through Vinca to Pakan, although variability was high. For these three locations, bank-to-bank differences were not significant ($P<0.05$, $n = 9$).

The seasonal pattern of chl-a distribution was more distinct at locations downstream than upstream of Beverly Bridge. At upstream locations, algal standing stocks remained relatively low and stable throughout the sampling period. At the Beverly Bridge right-bank site and at all locations downstream, epilithic chl-a reached a first maximum in June (between the local runoff and mountain runoff peaks) and a second maximum from late August to early November. An overview of right-bank data is given in Figure 12.4. The spring peaks for both potamo-phytoplankton and epilithic algal chl-a coincided, but the "summer" epilithic maximum lagged several weeks behind the potamo-phytoplankton peak. This was probably due to scouring and related effects during the maximum flow period in late June and early July, as discussed below, as well as to the slower re-establishment rate for epilithic species over planktonic species.

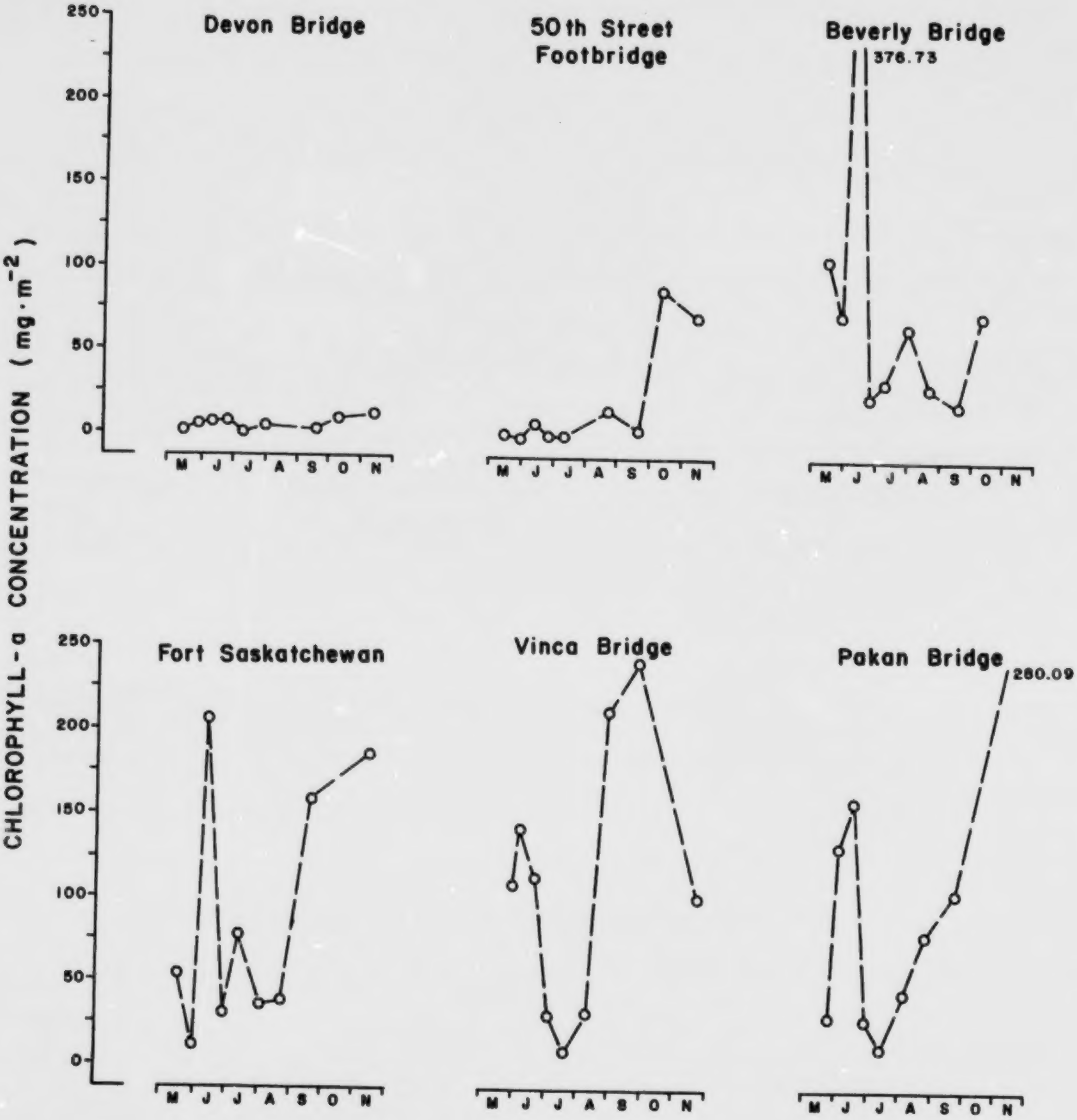


Fig. 12.4 Seasonal pattern of epilithic algal chlorophyll-a concentration at right bank sites of the North Saskatchewan River in 1983.

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

12.3 Discussion: River Chlorophyll-a

The total amount of material transported by rivers tends to increase gradually and naturally in downstream direction (e.g. Hynes 1972). As current velocity decreases and loads of dissolved solids increase, plankton concentrations also tend to increase. Although a downstream increase in chl-a in the NSR may be due in part to natural causes, it is undoubtedly influenced by urban and industrial development in the vicinity of Edmonton. In this study, the most obvious change in chl-a values that could be linked to these developments was the doubling of epilithic and planktonic chl-a in the 5 km river section between 50th Street Footbridge and Beverly Bridge on the right bank. The major effluent entering the NSR between these two sites is from the Gold Bar Wastewater Treatment Plant (GBWTP), which enters the river on the right bank. A comparable increase in chl-a on the left bank occurred about 24 km downstream of Beverly Bridge at Fort Saskatchewan, probably the result of the combined effects of discharges from the St. Albert sewage lagoons and lateral mixing in the NSR, which could have allowed effects of the GBWTP effluent to extend to the left bank. Similar increases in chl-a concentrations in the Oldman River below Lethbridge, and in the Bow River below Calgary, have been attributed to nutrients in sewage treatment plant effluents (e.g. Davies _et al_. 1977, Hamilton 1983).

Because chl-a was monitored for only six months of one year in the NSR (May to November, 1983), it is unwise to generalize from patterns found in 1983, especially because it was a year of atypical discharge (see Section 2.4). There was an inverse relationship between chl-a concentrations and seasonal discharge which, in the NSR as in many other rivers (e.g. Hynes 1972, Lack 1971, Tett et al. 1978), was likely the main factor regulating algal standing stock. On the other hand, chl-a patterns showed a direct relationship with temperature and light. Consequently, the relative contributions of direct and inverse factors on algal development were difficult to assess.

Phytoplankton chl-a peaks are common in spring after ice melt when rising temperatures, clear water, higher light intensity, and greater day length favor the development of algal populations. Increases in river flow rates due to local and mountain runoff suppress the development of algal populations. Increases in velocity result in a shorter residence time for potamo-phytoplankton and increases in water volume reduce algal density through dilution. Attached algae are removed by faster currents as a result of the scouring effect of silt-laden water (Hynes 1972).

In the NSR, planktonic chl-a concentrations began to increase soon after the decline in spring high flows and reached a peak in early August, when temperatures were highest and light conditions were optimal. The lag in the recovery of epilithic chl-a relative to planktonic chl-a suggested that epilithic algae were affected by the persistent effects of peak discharges. The NSR is usually extremely turbid during high flow periods (Patterson and Nursal 1975). This was the case in 1983, as indicated by a sharp peak in the non-filterable residue (NFR) content of the river during high-flow periods. However, NFRs returned to normal levels when flow rates dropped. Scouring and light inhibition due to heavy silt loads were the most probable causes of chl-a reduction during this period. When flows decreased, a considerable amount of silt was deposited on the substrate, smothering the attached algae that remained after scouring, and further retarding recovery.

Differences in longitudinal, potamo-phytoplankton chl-a concentration were most accentuated during the summer low flow period, when the residence time of phytoplankton was long, and light and temperature conditions were near optimal. Algal growth under these conditions was more likely to be limited by nutrient concentrations than by physical factors. The much higher chl-a concentrations downstream of Edmonton reflected the higher nutrient concentrations below the city. Differences in upstream-downstream nutrient levels persisted during the fall, but all algal growth was inhibited by dropping temperatures and lower light intensities. The "flushing" effect of peak flows was the main determinant of algal standing stock during the spring.

12.4 Surface Water Quality Objectives

No water quality guidelines or objectives for photosynthetic pigment concentrations have been established by provincial (Alberta Environment 1977) or federal (see McNeely et al. 1979) authorities. In the absence of guidelines or objectives, chl-a data will be discussed in terms of their importance in relation to eutrophication, nutrient levels, and potential dissolved oxygen depletion.

Planktonic chl-a concentration is one of the variables that has been used in the trophic classification of lentic habitats (Wetzel 1975, OECD 1982). In its 'fixed boundary system', the OECD (1982) proposed the following boundaries:

	mean chl-a ($mg.m^{-3}$)	peak chl-a ($mg.m^{-3}$)
ultra-oligotrophic	<1.0	<2.5
oligotrophic	<2.5	<8.0
mesotrophic	2.5 - 8	8 - 25
eutrophic	8 - 25	25 - 75
hypertrophic	>25	>75

A comparable classification system has not been published for lotic habitats, so the classification for lentic habitats has been applied occasionally to lotic habitats for comparative purposes (e.g., Davies et al. 1977). Because comparisons between different systems are not necessarily valid, the application of this classification to rivers may be largely academic in value. This point is made by Hynes (1969), who indicates that running water is more "fertile" than standing water of the same chemical quality because turbulence prevents the formation of nutrient depleted zones around plants.

If the fixed boundary system proposed by the OECD for the trophic classification of lentic waters is applied to the 1983 NSR data, the river water at Devon would be classified as ultra-oligotrophic on the basis of mean chl-a concentrations, or as oligotrophic on the basis of peak chl-a values. At Pakan, the water would be classified as eutrophic on either basis.

An attempt to classify the rivers of southern Alberta according to their trophic status was made by Hamilton (1983), who proposed a classification system based upon the carbon content of epilithic algae. He suggested a chlorophyll-to-carbon ratio of 20:1 as an acceptable conversion factor, but recognized that this ratio can vary considerably (H.R. Hamilton, pers. comm.). The proposed classification based on epilithic carbon or chl-a concentration has the following boundaries:

	mean carbon ($mg.m^{-2}$)	mean chl-a ($mg.m^{-2}$)
oligotrophic	<0.5	<10.0
mesotrophic	0.5 - 5	10 - 100
eutrophic	5 - 20	100 - 400
hypertrophic	>20	>400

In 1983, the NSR at Devon fell into the higher range of the oligotrophic category according to the above classification system. The river was mesotrophic at the 50th Street Footbridge, and remained in the lower range of this category at Beverly Bridge. Although the chl-a concentration increased further downstream, the river remained mesotrophic, with the exception of the Vinca Bridge right-bank site, which would have been considered eutrophic under this system.

12.5 Impacts

The potamo-phytoplankton and epilithic algal chl-a concentrations in the NSR between Devon and Pakan were generally low to moderate and, as indicators of algal abundance, were not a major cause for concern prior to the conclusion of this study. However, the perpetuation of present nutrient levels or any increase in nutrient levels, combined with decreased scouring and increased clarity due to low flows, is likely to enhance algal growth. Enhanced epilithic growth would contribute to substrate fouling, and could contribute to nocturnal dissolved oxygen reduction in summer and to lower dissolved oxygen levels in winter.

Between sundown and sunrise, autotrophic oxygen production from photosynthesis is greatly reduced or absent, whereas oxygen consumption due to respiration continues in both autotrophic and heterotrophic organisms. Consequently, there can be a nocturnal decline or total depletion of dissolved oxygen when algal standing stocks are high. This situation is most likely to occur in summer months when oxygen solubility is lowest due to high temperatures.

In winter, dissolved oxygen levels may decline throughout the 24-hour day. Photosynthesis is inhibited by low temperatures, and by low light levels due to the combined effects of short days, ice cover, and snow cover; reoxygenation from the atmosphere is also inhibited by ice cover. Oxygen consumption can be high because of the respirational demands of living organisms and because of the decomposition of accumulated organic materials.

13.0 CARBON

Carbon is a major constituent of the aquatic environment. In natural waters, most inorganic carbon occurs as dissociation species of carbonic acid in a dynamic equilibrium affected by atmospheric conditions and by the respiration and photosynthesis of living organisms. Organic carbon occurs as dissolved compounds in the water and as cells of, and breakdown particles from, living and dead organisms.

In this study, sampling for inorganic and organic carbon was done on the same schedule (Tables 4.4, 4.5) as sampling for major ions and nutrients: 11 mainstem North Saskatchewan River (NSR) locations on 12 dates in the 1982 study; 6 mainstem NSR locations on 12 dates in the 1983 study which was extended to include two winter dates in 1984. Municipal sewage treatment plant effluents, industrial effluents, and major tributaries were sampled in 1983 only; sampling dates are summarized in Table 4.6.

Total organic carbon (TOC) was analyzed by the City of Edmonton laboratory until the end of November, 1982; the Alberta Environmental Centre (AEC) laboratory at Vegreville performed analyses for dissolved organic carbon (DOC) and total particulate carbon (TPC) from August 1982 until March 1984. In most natural waters, TPC is approximately equivalent to particulate organic carbon (F. Dieken, AEC pers. comm.). For three data sets in the fall of 1982, the total organic carbon results from the two laboratories were significantly different ($P<0.001$, $n = 41$). Therefore, 1982 and 1983 data are not comparable, and only 1983 organic carbon data are treated further. Additional details on sampling and analysis are given in Section 5.0.

13.1 Results and Discussion: Inorganic Carbon

Values for dissolved inorganic carbon (DIC) showed no clear spatial or temporal pattern or trend in the study section of the NSR in 1982 or 1983. Concentration ranges and medians were similar in samples from locations upstream and downstream of the City of Edmonton:

Location	Range	Median
Devon (1)	29 to 35.8 $mg \cdot L^{-1}$	32 $mg \cdot L^{-1}$
Beverly Bridge (6)	29 to 36 $mg \cdot L^{-1}$	33 $mg \cdot L^{-1}$
Pakan (11)	28 to 37 $mg \cdot L^{-1}$	33 $mg \cdot L^{-1}$

The distribution and ranges of values for DIC in the study section of the NSR suggest strongly that DIC concentrations are unaffected by municipal, industrial, or tributary inputs in the vicinity of the City of Edmonton.

13.2 Results and Discussion: Organic Carbon

Total organic carbon (TOC) concentrations tended to vary with the volume of river flow (Fig. 13.1; $r^2 = 0.63$ for Beverly Bridge centre site). Of the total carbon in the river water, only the dissolved organic fraction (DOC) seemed to be affected by municipal treatment plant and industrial effluents and by discharges from tributary creeks. High values during peak flows were largely attributable to inputs from runoff; DOC values were consistently higher in tributary creeks and rivers than in the mainstem NSR.

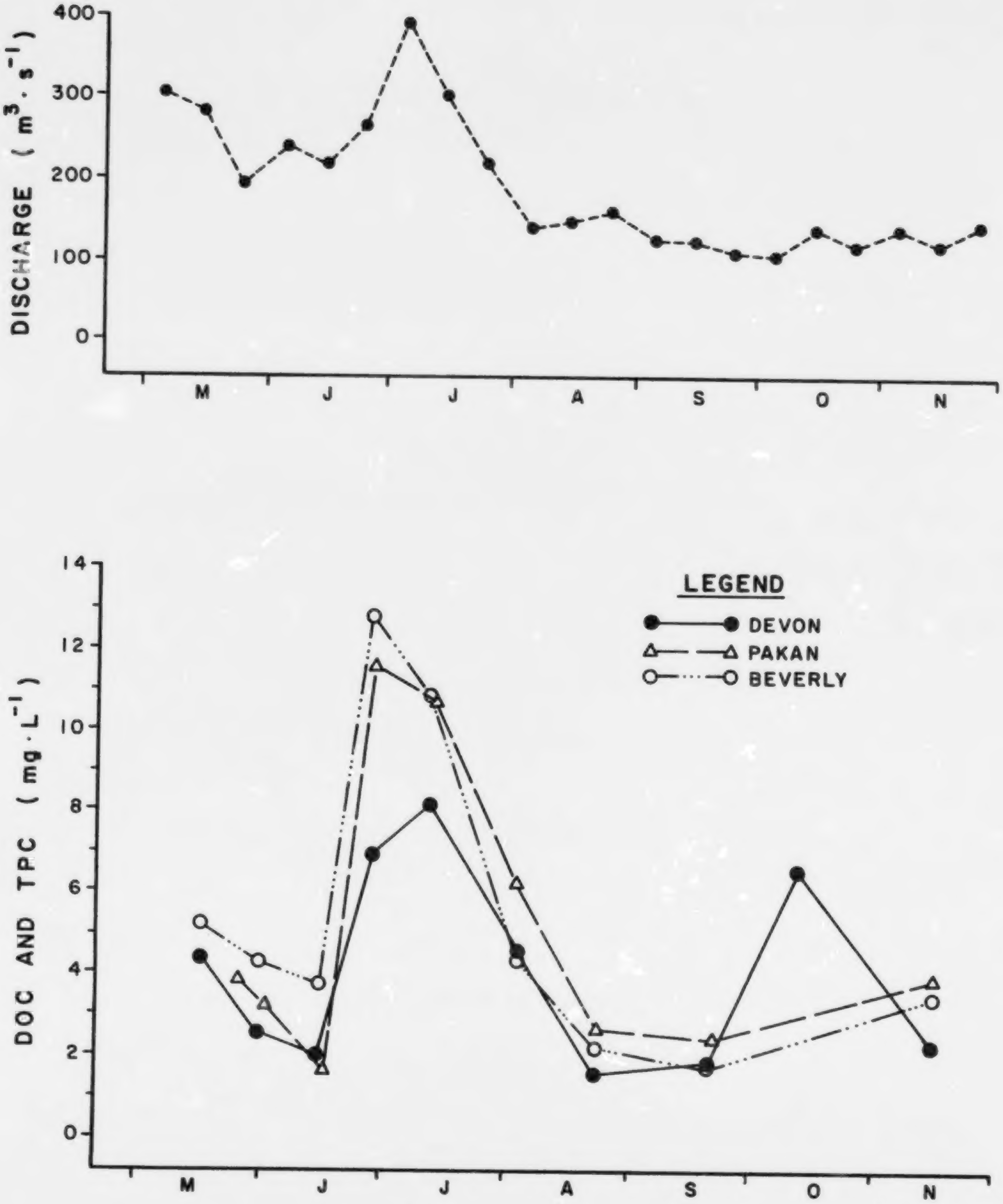


Fig. 13.1 DOC and TPC in the NSR at Devon, Beverly and Pakan ; and NSR discharge at Edmonton, 1983. L, C & R samples averaged .

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

Median DOC values for each sampling location from Devon to Pakan for 1983 are shown in Figure 13.2. Values from center-channel sites increased in a downstream direction between Devon and Pakan, but values from left-bank sites remained at background level (Devon) through the City of Edmonton. A large increase in left-bank DOC values was observed between Fort Saskatchewan and Vinca ($P<0.05$, $n = 13$). The high values at all sites at Vinca reflects inputs from the Sturgeon River (median 1983 DOC = 16 $mg \cdot L^{-1}$, $n = 9$) and the Redwater River (median 1983 DOC = 20 $mg \cdot L^{-1}$, $n = 9$), as well as municipal effluents which entered the NSR downstream of Edmonton. The median DOC value increased sharply at the Beverly Bridge right-bank site downstream of the Gold Bar Wastewater Treatment Plant (GBWTP), and was significantly higher than the left-bank median value ($P<0.01$, $n = 12$). As Figure 13.2 shows, highest median values were observed at Pakan. The Devon and Pakan DOC data sets were significantly different ($P<0.05$, $n = 14$).

The summary of median TPC values for 1983 given in Figure 13.3 suggests both longitudinal and bank-to-bank differences. However, the range of values was large for and inconsistent among all locations and sites, and there were no significant differences between data sets for any of the sampling locations, including those for Devon and Pakan ($P>0.10$, $n = 14$). Additionally, there were no significant bank-to-bank differences in TPC values, even when median values appeared quite different, as was the case for Beverly Bridge ($P>0.5$, $n = 12$).

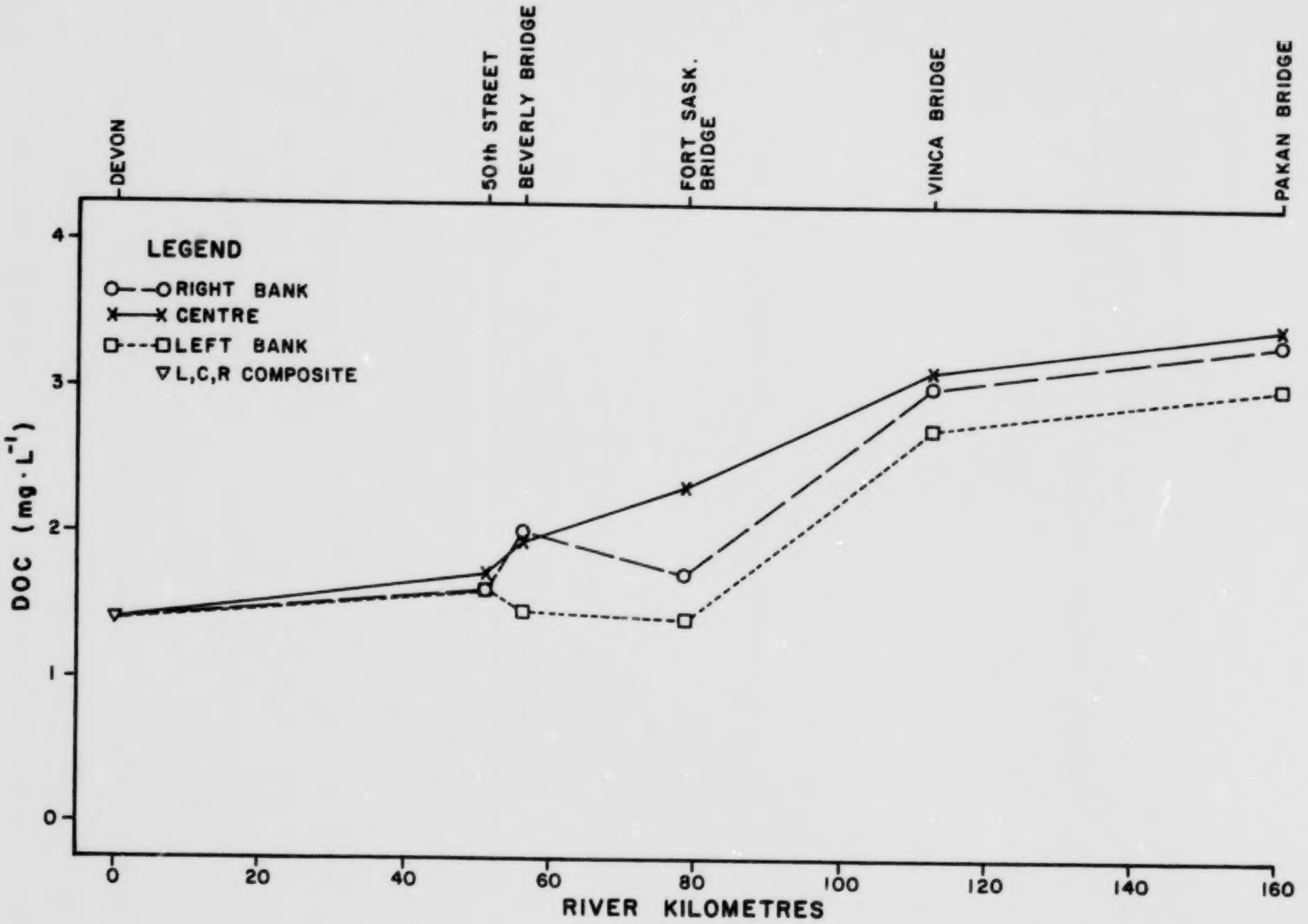


Fig. 13.2 Dissolved Organic Carbon in the NSR. Median values May-November, 1983.

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

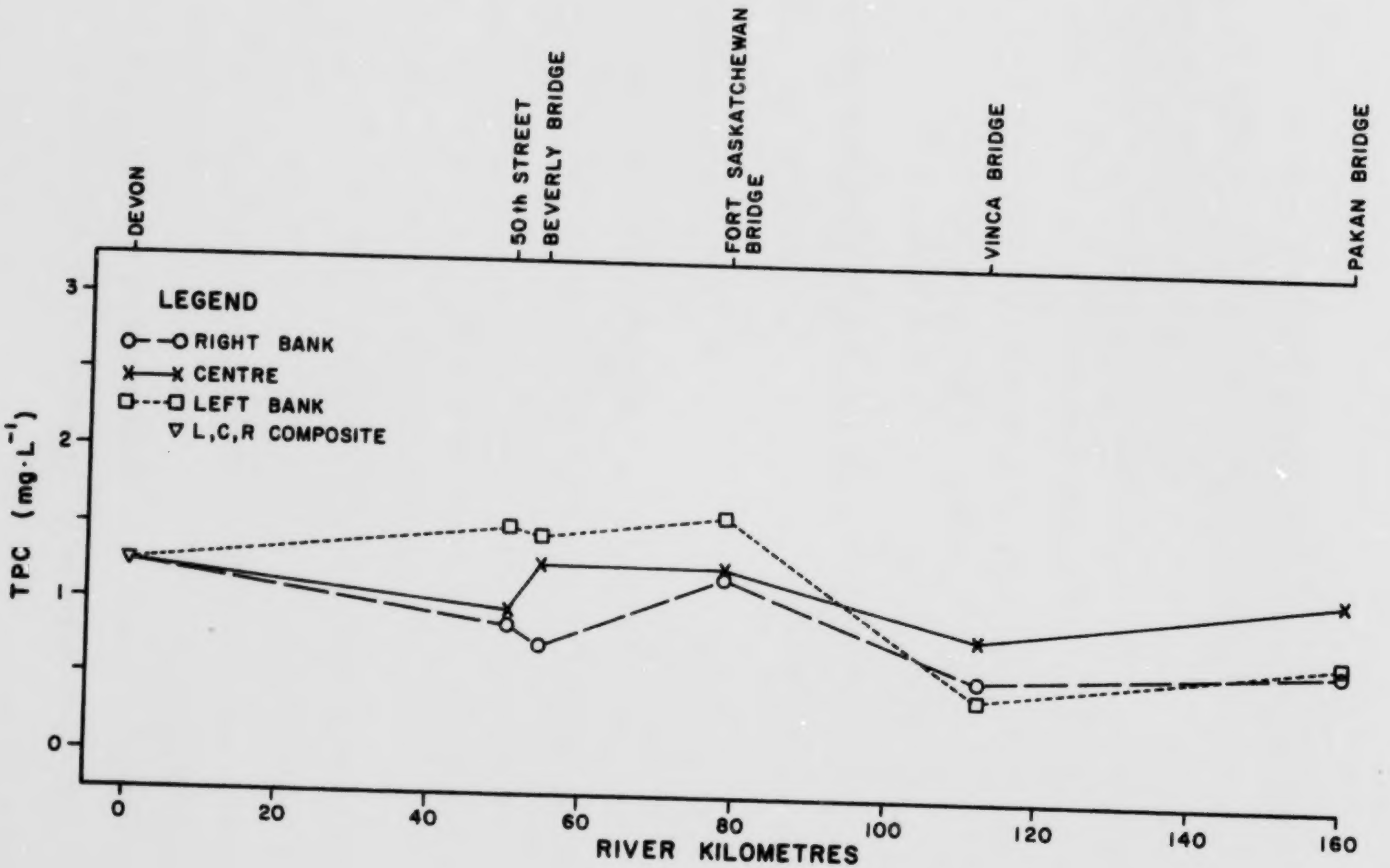


Fig. 13.3 Total Particulate Carbon in the NSR. Median values May-November, 1983.

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

The River Water Quality Monitoring Network data for particulate organic carbon (POC) collected at Devon during the same period were significantly lower than those collected at Pakan ($P<0.005$, $n = 7$). The POC data from the River Water Quality Monitoring Network and from the present study were similar during the peak-flow period from late June to early July, when values at Pakan were more than double those at Devon. During low flows, however, values fluctuated greatly and the two sets of data were less similar.

There were no clear relationships between municipal or industrial discharges and particulate carbon.

13.3 Surface Water Quality Objectives

There are no Alberta Surface Water Quality Objectives (ASWQO) for DIC, nor have DIC concentration limits been set in any federal criteria (McNeely et al. 1979). However, there is a close relationship between DIC and alkalinity. Alkalinity values in the range of 30 to 500 $mg{\cdot}L^{-1}$ $CaCO_3$ equivalent are considered acceptable in surface waters (Department of National Health and Welfare 1969). This is roughly equivalent to a DIC range of 4 to 60 $mg{\cdot}L^{-1}$. For the protection of life in the aquatic environment, guidelines stipulate that alkalinity should be maintained near natural background levels with no sudden variations (Environmental Studies Board 1973). The DIC levels in NSR water measured in the present study fell within acceptable limits.

There are no ASWQO for organic carbon. The median DOC concentrations in the study section of the NSR were 1.0 $mg \cdot L^{-1}$ at Devon, and ranged from 1.05 to 1.9 $mg \cdot L^{-1}$ at Beverly Bridge, and from 2.05 to 3.4 $mg \cdot L^{-1}$ at Pakan, all well below the world average of 5.8 $mg \cdot L^{-1}$ in rivers (Wetzel 1983). However, the almost doubling of mean DOC values from 50th Street to the Vinca Bridge was indicative of organic enrichment.

13.4 Impacts

The presence of considerable concentrations of TOC in surface waters can add greatly to the biochemical oxygen demand (BOD) in the waters.

Particulate organic matter, which is often high in carbon content, may serve as a food substrate for bacteria. Organic particles and their bacterial flora are the major food source for a number of invertebrate groups, such as certain species of oligochaetes, dipteran larvae, and caddisfly larvae. The first two groups are often found in moderate to huge numbers in those sections of rivers immediately downstream of organic enrichment inputs. As noted in Part II of this report (zoobenthos), this may be the explanation for large numbers of oligochaetes at the site below the GBWTP and the sites downstream of Fort Saskatchewan.

14.0 BACTERIA

Microbiological samples collected during 1982-83 were analyzed for total coliform bacteria, fecal coliform bacteria, fecal streptococci and a general group known as heterotrophic bacteria. Coliform bacteria are widely used as a surrogate to indicate the presence of warm-blooded animal wastes and the potential of exposure to pathogenic organisms associated with the wastes. Pathogenic organisms are usually excreted in numbers which are several orders of magnitude smaller than those for coliform bacteria.

The total coliform (TC) group includes all aerobic and facultatively anaerobic, gram-negative, non-sporeforming, cytochrome oxidase negative, rod-shaped bacteria that ferment lactose with gas formation within 48 hours at 35°C. Many coliforms are ubiquitous in the environment; they are common in both soil and water and can multiply outside the intestinal tracts of animals. TC data have been used historically for determining long-term trends and assessing the general bacteriological quality of drinking water. Because these bacteria have many sources, however, they are not reliable as indicators of fecal contamination.

The fecal coliform (FC) group includes those coliforms capable of forming gas within 24 hours at 44.5°C. FC bacteria are the primary surrogate indicators of the bacteriological quality of recreational or raw water (Department of National Health and Welfare 1979) and their presence suggests contamination of intestinal origin, either from humans or other warm-blooded animals. The use of coliforms as indicators of fecal contamination is open to considerable debate, but it is traditionally continued because of the ease of sample collection and analysis, and because results are readily comparable with established water quality standards and historical data.

Fecal streptococci (FS) are large, ovoid, gram-positive, chain bacteria that are present in the feces of humans and all warm-blooded animals. Fecal streptococci are more resistent to natural and technological purification processes than are coliforms and, therefore, are assumed to be better indicators of pollution at distances from the source where coliforms would no longer be present. Some studies (see Department of National Health and Welfare 1983) have shown a correlation between high FS numbers and illness rates in persons using recreational waters. Although these studies are somewhat inconclusive, they suggest that FS may be better surrogate indicators of potential virus presence than are the coliforms (McNeely et al. 1979).

Fecal streptococci are sometimes used in conjunction with fecal coliforms to determine whether a pollution source is of human or non-human origin. Geldreich and Kenner (1969) proposed that a FC:FS ratio above 4 indicates a human source, whereas a ratio below 0.7 indicates fecal material from domestic animals. They suggested that this ratio is only applicable during the first 24 h that the bacteria are in the river. Wheater et al. (1979) question the reliability of such ratios, because they vary with season, human population, type of animal contaminating the water, and differential die-off rates of the bacteria. With some reservations, FC:FS may be helpful in determining the source of contamination when bacterial numbers are high.

Another group of bacteria found in water are the heterotrophs. This is a heterogenous group of aerobic and facultative anaerobic organisms that will grow on tryptose-glucose extract agar. The number of colonies counted on a plate of such medium is called the Standard Plate Count and is expressed as numbers per millilitre of sample water. Under given conditions, the Standard Plate Count, as an indicator of heterotrophic bacterial abundance, may be proportional to the amount of organic enrichment, the length of time organic matter has been in the water, and the general biological activity in the sample. It is believed that the Standard Plate Count greatly underestimates the numbers of heterotrophic bacteria present in running waters, because all species do not grow equally well under the standard conditions (Hynes 1972).

Bacteriological samples collected in 1982 and 1983 were analyzed by the Environmental Protection Service, Environment Canada, Edmonton. The membrane filtration (MF) technique was used for TC, FC and FS bacteria; heterotrophic bacteria were enumerated as a Standard Plate Count (Bell 1983). Additional comments on methods are included in the general methods section.

The two standard procedures used for analyzing indicator bacteria are the most probable number (MPN) technique and the membrane filter (MF) technique. The MF technique is fast and efficient, highly reproducible, and can be used for a variety of natural waters. However, when turbidity in the sample is high, the filter may clog before a sufficient volume of water has passed through.

Furthermore, when numbers of non-coliform bacteria are high or when toxic substances are present, the estimated number of coliforms may be low (American Public Health Association et al. 1980). Although these limitations may have affected a sample occasionally during the study, the MF technique has been used for several years on the NSR by the Environmental Protection Service, Environment Canada, Edmonton. The possible limitations of the MF test are far outweighed by its efficiency and reliability compared to the MPN test (F. Zaal, pers. comm).

14.1 Results and Discussion: Seasonal Trends

Although the bacteria data fluctuated to some extent over the two study years, seasonal patterns were discernible in most of the data sets. Figures 14.1 to 14.3 present seasonal data for TC, FC, and FS collected in 1982 and 1983 at the upstream location (Devon), a mid-city location (Beverly Bridge), and the most downstream location (Pakan) in the study section of the NSR.

At Devon, counts for all three indicator groups were somewhat elevated during the period of highest water flow from late June to early July, both years. Agricultural runoff during precipitation events and soil bacteria are probably the main contributors to these high counts, since the FC:FS ratio was below 0.7 for all samples. In 1982, numbers increased in August, when flow in the river was low. The source of these bacteria is unknown. The closest municipal

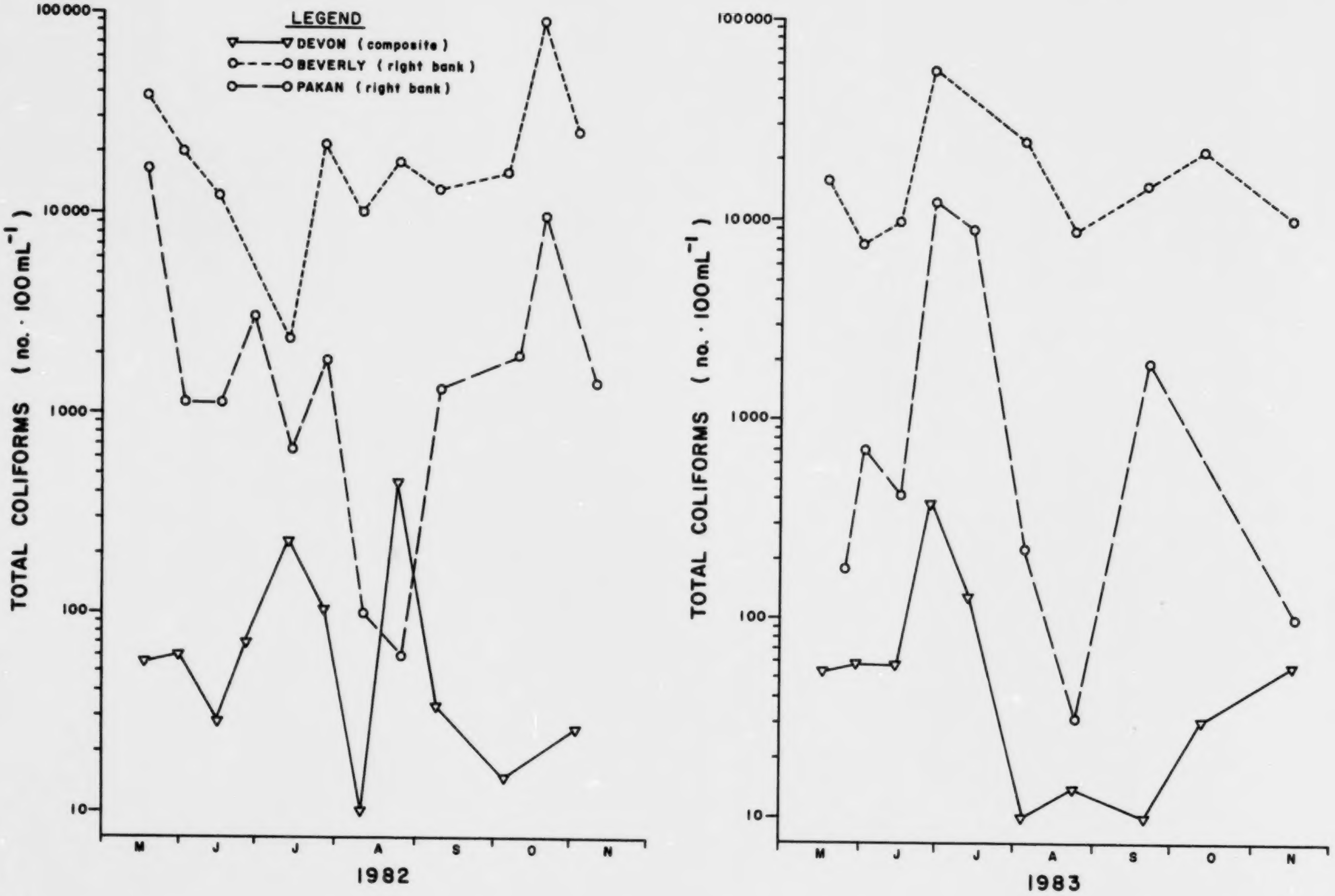


Fig. 14.1 Total Coliforms in the NSR at Devon, Beverly bridge and Pakan, 1982 and 1983.

ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

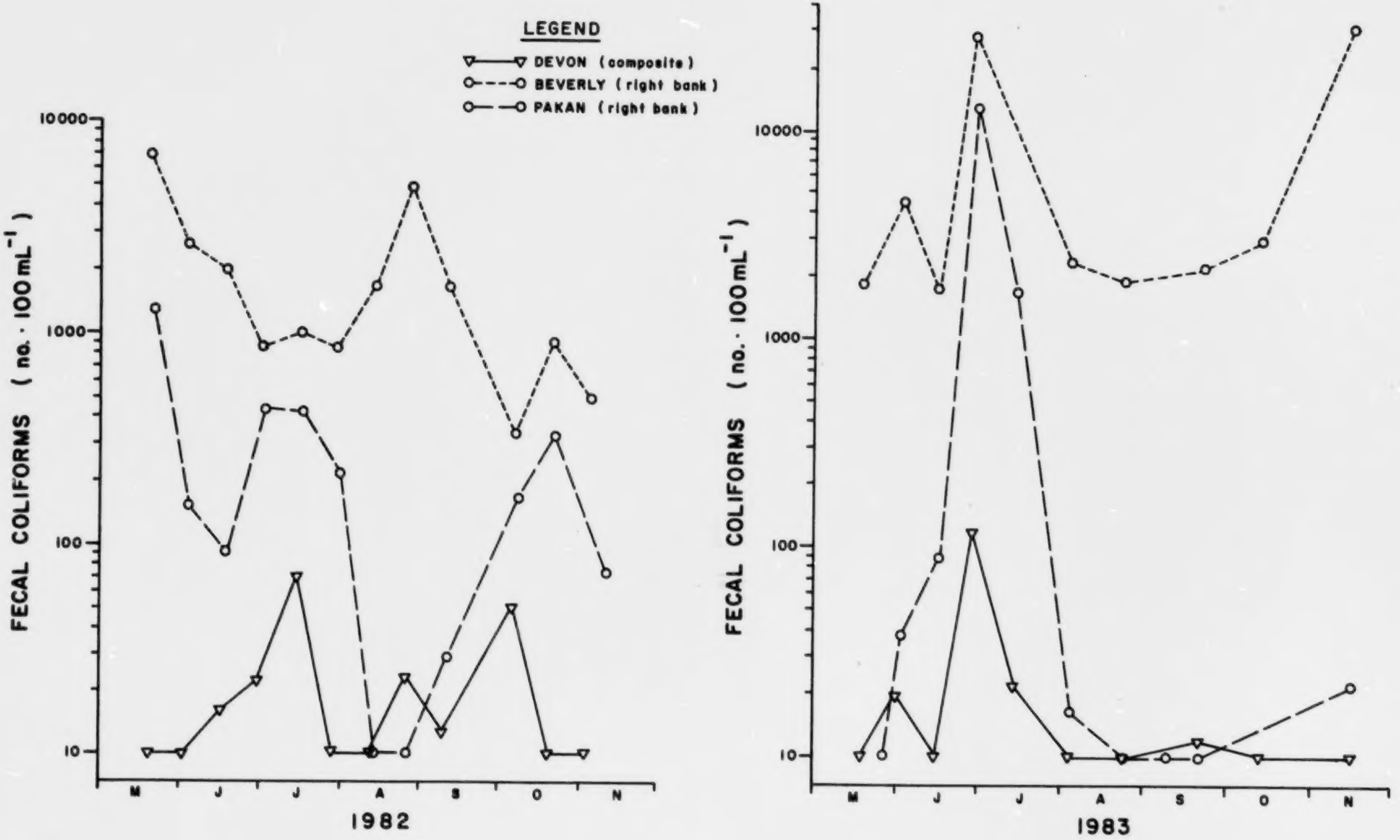


Fig. 14.2 Fecal Coliforms in the NSR at Devon, Beverly bridge and Pakan, 1982 and 1983.

ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

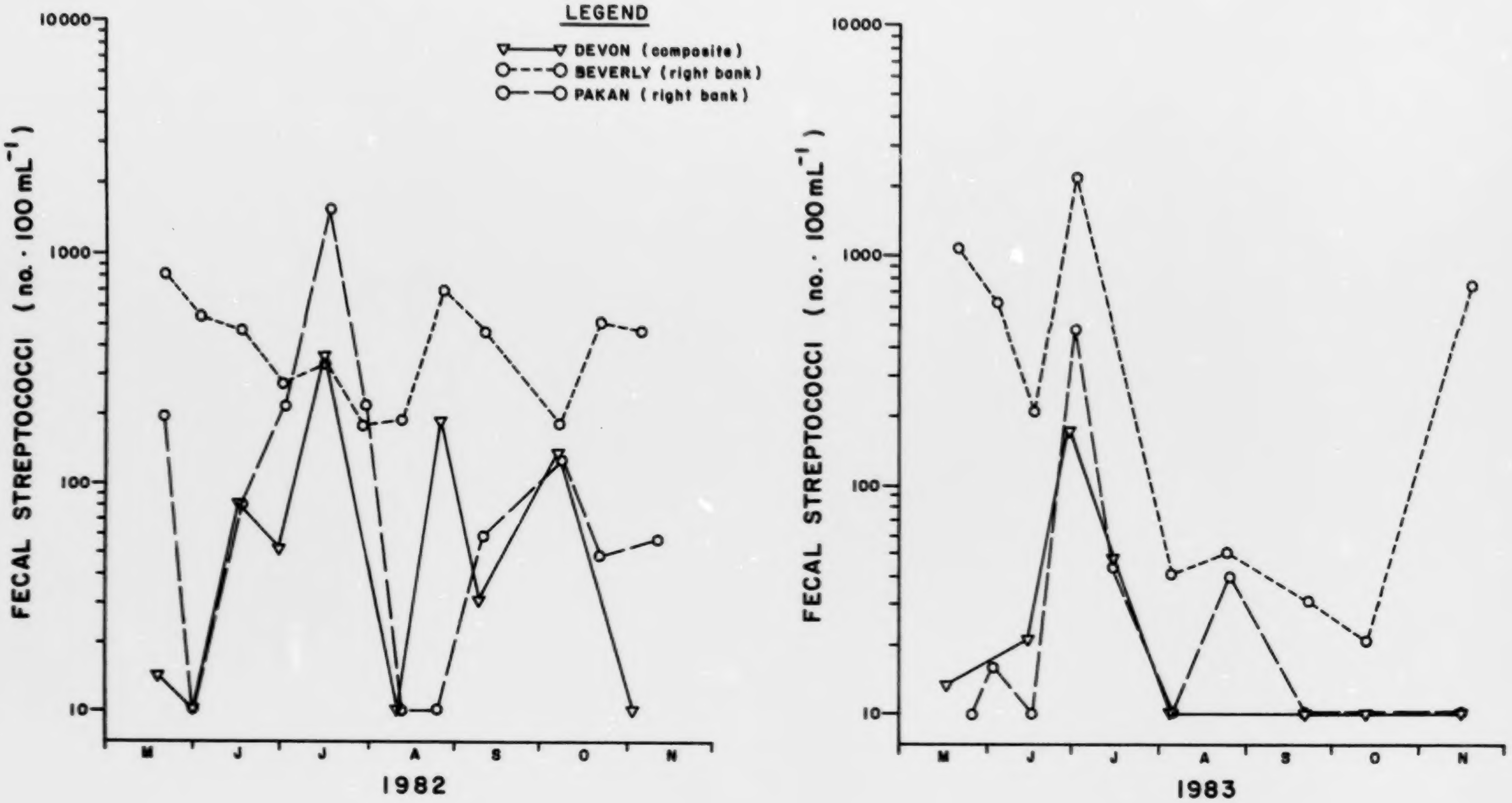


Fig. 14.3 Fecal Streptococci in the N S R at Devon , Beverly bridge and Pakan , 1982 and 1983 .

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

discharge came from Calmar via Conjuring Creek and entered the NSR about five river kilometres upstream of the sampling location at Devon. However, the discharge from the Calmar lagoons took place in May and October in 1982 (L. North, pers. comm.). An increase in coliforms might have been expected as a result of the discharge in late October, but this was not the case. Fecal coliforms were less than 10 per 100 mL on October 19 and November 2 at the Devon location, suggesting that this small discharge has little impact on the river.

Counts of indicator bacteria at the Beverly Bridge right-bank site were often two orders of magnitude higher than at Devon. The right-bank site is located within the unmixed plume from the Gold Bar Wastewater Treatment Plant (GBWTP) where high numbers of bacteria would be expected. Counts of indicator bacteria at Beverly Bridge in 1982 were low in July, when heavy rainfall and subsequent high river flow (1100 m^3s^{-1}) diluted the sewage effluent entering the river. As flows declined and subsequent dilution of sewage effluent decreased, numbers of bacteria increased. The 1983 seasonal pattern was characterized by very high values for all indicator bacteria in late June, and very low values in August. The high June counts may be explained by the concentrating effect of relatively high flow from the sewage treatment plant combined with a low flow in the river at that time. The effects of dilution during peak flow in July 1983, which was considerably lower (375 m^3s^{-1}) than the peak flow of the previous year, were not apparent. The somewhat lower counts in August of 1983 than August 1982 may represent natural variation, although temperatures were somewhat higher in August 1983 than in the previous year. Higher water temperatures and light intensity in August are factors that would contribute to higher natural die-off rates among bacteria.

Seasonal fluctuations were more obvious at Pakan than at other sampling locations. Numerical variations are inversely related to the distance from the source (travel time of the river water) and the water temperature. When the water was cool and flows were high, such as in June and early July of both years, indicator bacteria survived in high numbers as far downstream of Edmonton as Pakan. For example, in June 1983 FC counts at the Pakan right-bank site were similar to those at the Beverly Bridge right-bank site (Fig. 14.2). Counts of all indicator bacteria declined rapidly to background levels (i.e. counts at Devon) in late July and August of both years.

Temperature is a major factor in bacterial survival. Geldreich et al. (1968) found that at 20°C, only 10% of an original population of FC would remain after 1.5 days (the approximate travel time from Beverly Bridge to Pakan at a flow of 140 $m^3 \cdot s^{-1}$), but at 10°C approximately 65% would remain. Even when flows are high, as in July 1982 (1100 $m^3 \cdot s^{-1}$), FC survival at 20°C would be only 25%, assuming a travel time of one day. Numbers of TC and FS at Pakan increased in fall 1982 when the water temperature declined. In fall 1983, counts of TC increased, but levels of FC and FS remained at background levels.

In general, a large portion of the bacteria entering the river from municipal discharges would be expected to survive as far as Pakan during peak flow in June or July; die-off would only reduce populations to background levels when water temperature were high during late July and August. Bacteria could also reach the Saskatchewan border in considerable numbers in spring and fall when waters are cool, even at low flows. Variations in local precipitation and subsequent surface runoff, and differences in die-off rates among bacteria complicate the interpretation of TC, FC, and FS data gathered during the summer period.

14.2 Results and Discussion: Spatial Trends

The sampling locations for the study were established to assess the impact of the city of Edmonton on the NSR. The bacteria data illustrate this impact particularly well. Figures 14.4 to 14.7 show median values of indicator and heterotrophic bacteria at each location for the study period.

Median counts of indicator bacteria at Devon were very low compared to those at downstream locations. None of the counts in individual samples exceeded 1000 TC/100mL or 200 FC/100mL. For discussion purposes, Devon median values of approximately 50TC/100mL and 10FC/100mL may be considered "natural" or background. These values are somewhat higher than medians calculated from the Alberta Environment River Water Quality Monitoring Network data collected

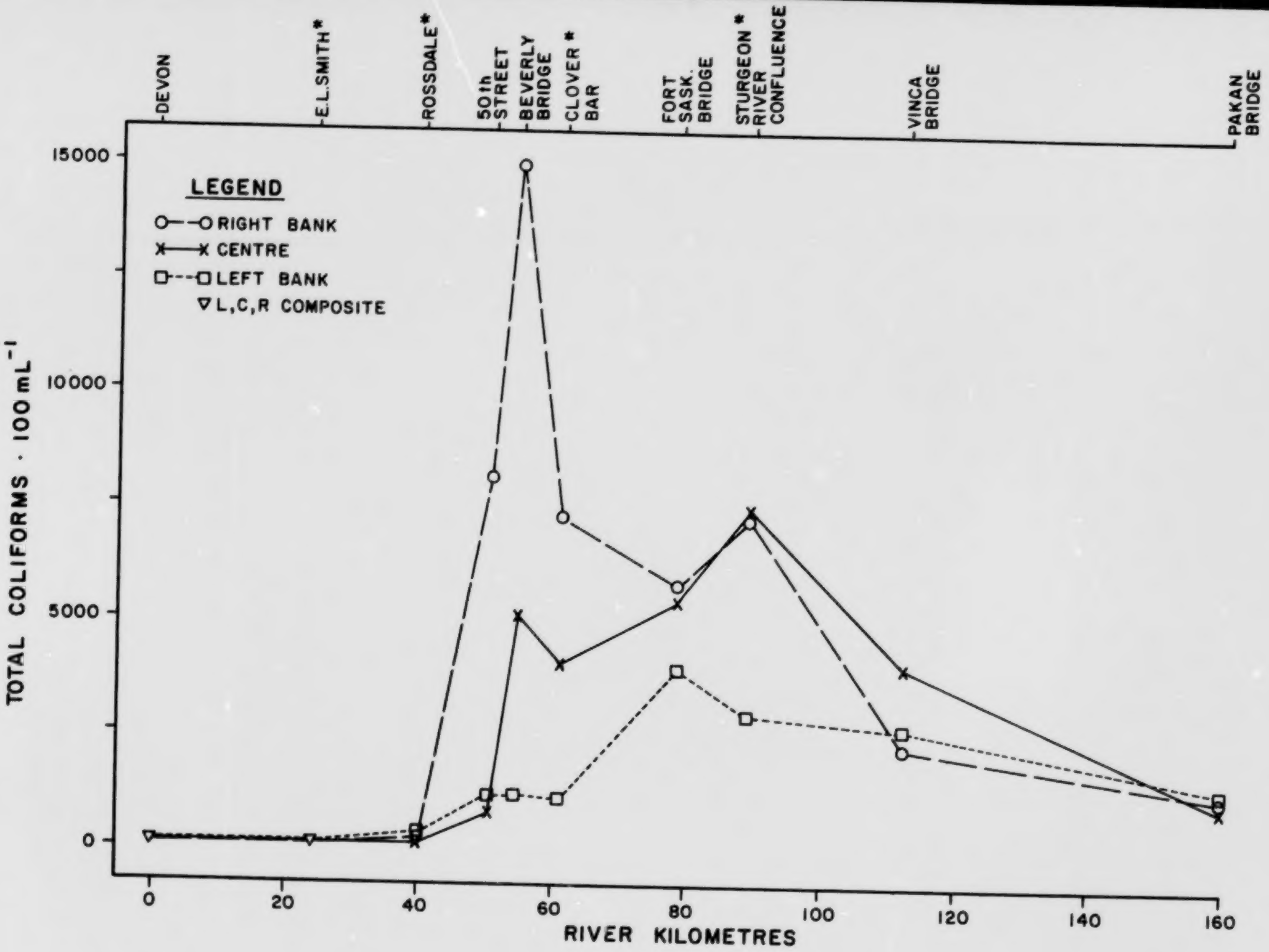


Fig. 14.4 Total Coliforms in the NSR. Median values May – November, 1982 and 1983. (* sampled 1982 only)

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

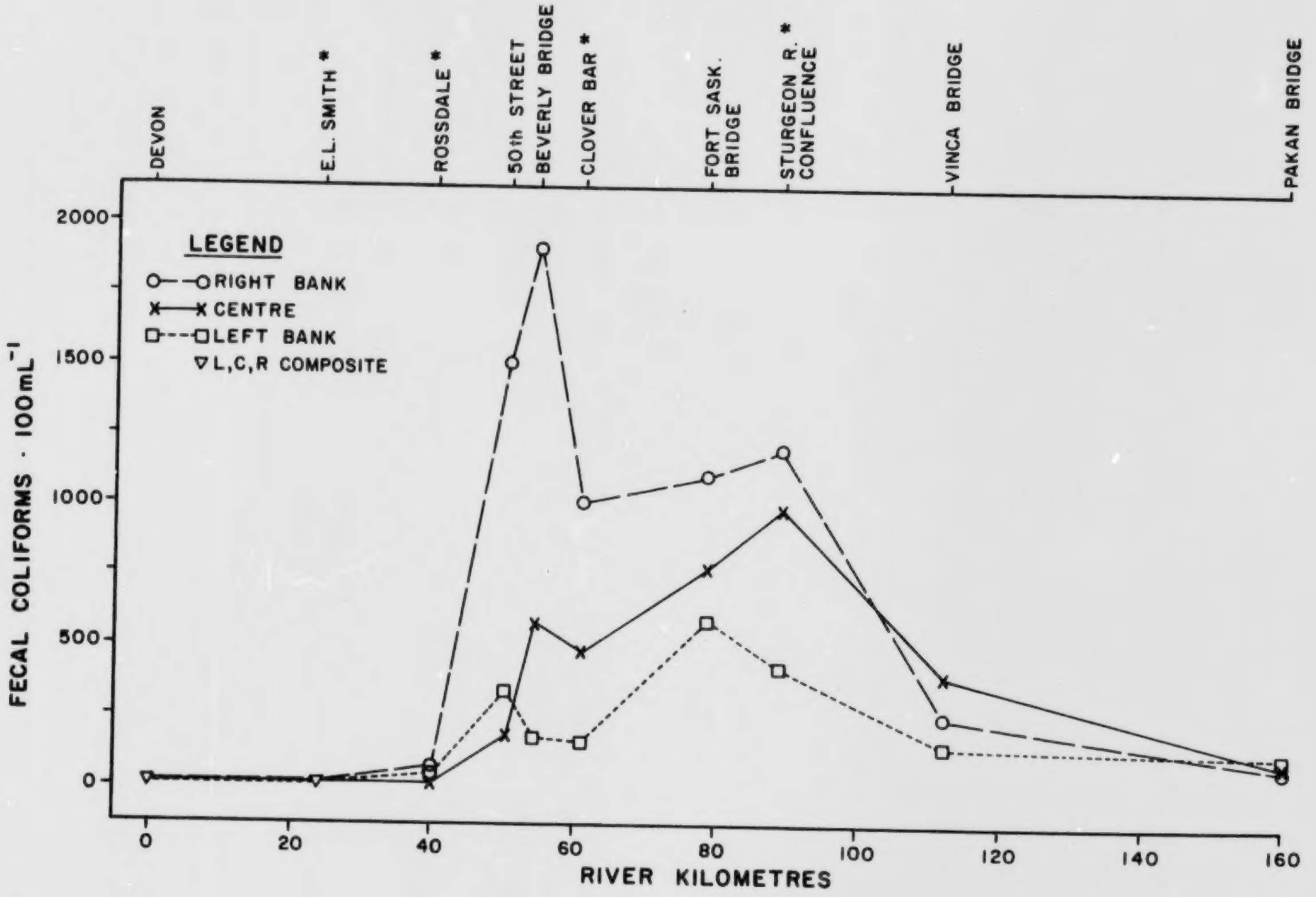


Fig. 14.5 Fecal Coliforms in the NSR. Median values May-November, 1982 and 1983. (* sampled 1982 only)

ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

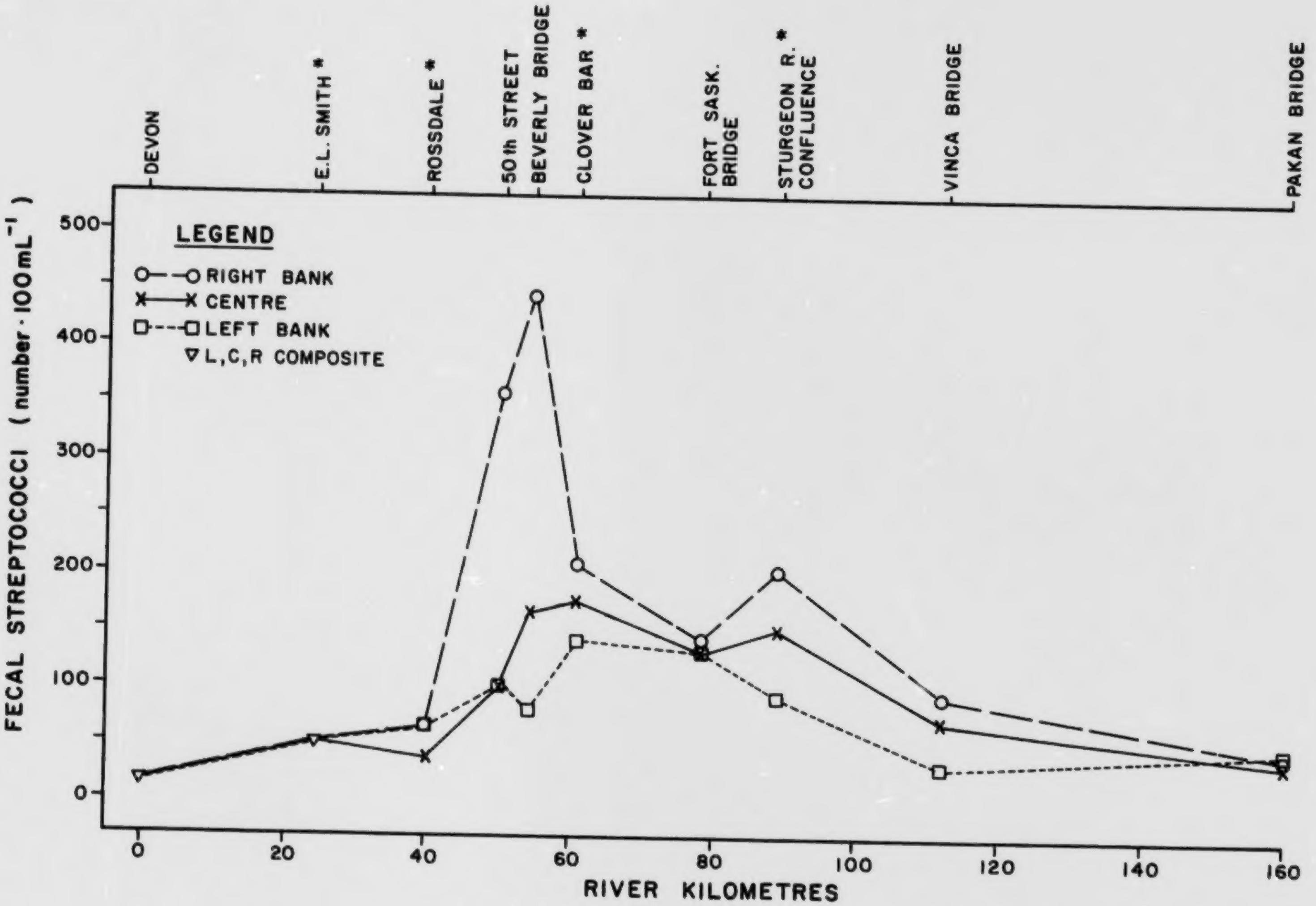


Fig. 14.6 Fecal Streptococci in the NSR. Median values May - November, 1982 and 1983. (* sampled 1982 only)

ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

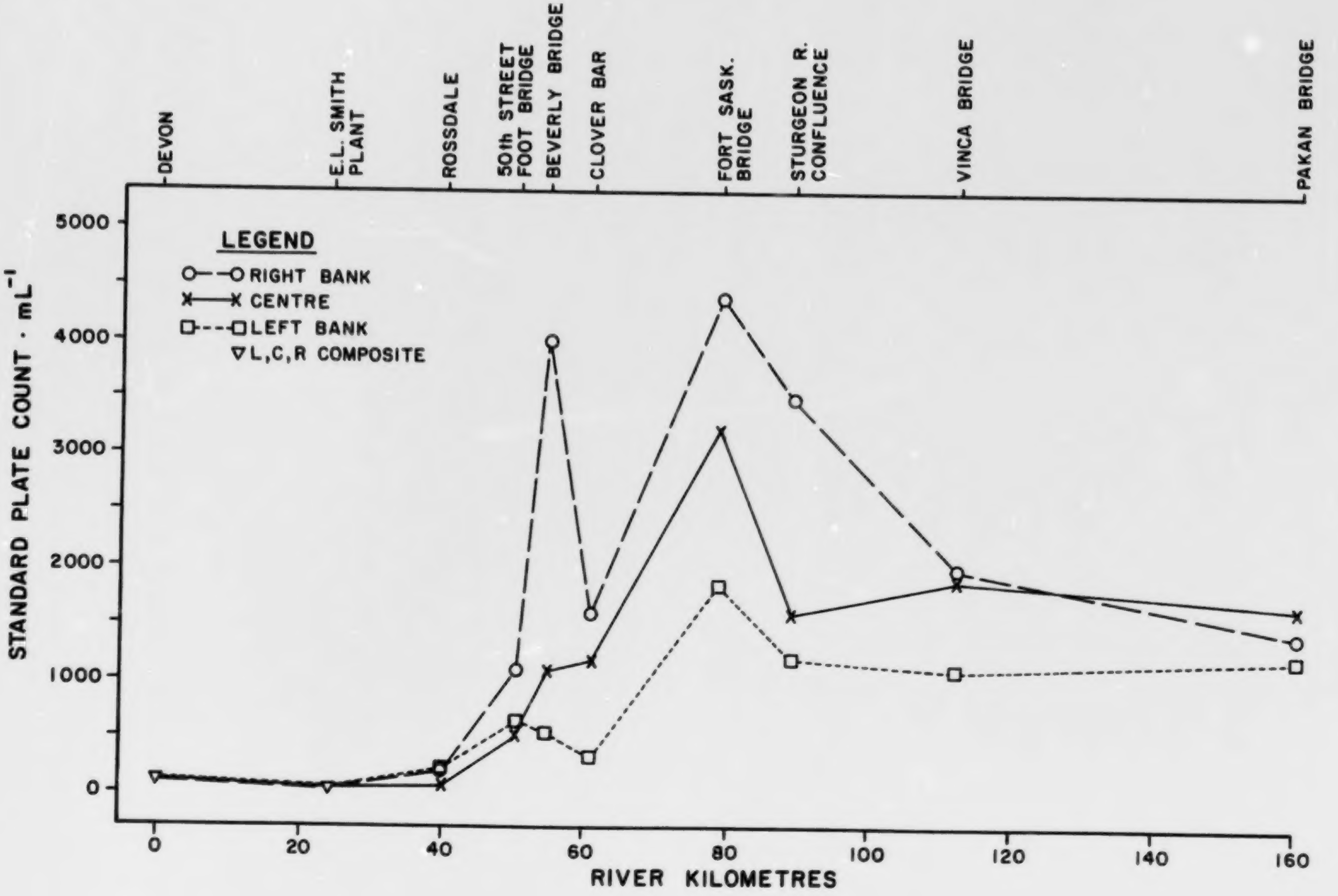


Fig. 14.7 Heterotrophic bacteria in the NSR (Standard Plate Count). Median values May - November , 1982 and 1983.

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

monthly at Devon during open water seasons, 1977-1982: 16 TC/100mL, 4 FC/100mL. However, it is likely that the difference between the two data sets represents year-to-year variations rather than a general increase in bacteria in the river at Devon.

The next sampling location downstream, E. L. Smith WTP, was sampled only in 1982. Counts of indicator and heterotrophic bacteria were similar to those at Devon, indicating no major inputs of bacteria between these locations.

Rossdale was the most upstream location sampled within the City of Edmonton and was sampled only in 1982. Counts in the centre of the river were similar to those at upstream locations. However, TC and FC counts from right-bank and left-bank sites were significantly higher than counts at E. L. Smith ($P<0.001$, $n = 11$). There was no significant difference between FS counts in samples from E. L. Smith and Rossdale. Sewage contamination of water in storm runoff seems possible, because the FC:FS ratios in right-bank and left-bank samples at Rossdale were generally higher than those in composite samples from E. L. Smith or centre-channel samples from Rossdale. In 1983, samples collected from Whitemud Creek contained levels of coliforms two to three times the levels measured in the NSR. The FC:FS ratio was greater than 4 in several of the Whitemud samples. Five small municipal effluents entered the Whitemud Creek system south of the city at that time. In addition to Whitemud Creek, five major storm sewers discharge on the right bank and six on the left bank of the

NSR above Rossdale; nineteen smaller storm or combined sewer outfalls are also located upstream of Rossdale (see Section 2.9). These discharges were not sampled during the study.

At 50th Street Footbridge, the next sampling location downstream, counts of indicator and heterotrophic bacteria were markedly higher in 1982 samples, especially in the right-bank samples. At this site, 42% of the samples had counts exceeding 2400 TC/100mL and FC counts were frequently above 200/100mL. FC/FS ratios were greater than 4 in 12 of the 22 right-bank samples from the 50th Street Footbridge location, suggesting human fecal contamination. Because this location was upstream of the GBWTP, potential sources of this contamination were investigated during 1983. Counts of coliforms in samples from the Fulton Creek discharge, which enters the river about 1 km above the 50th Street Footbridge location, were as high as those in sewage effluent (over 24,000/100mL for both TC and FC). It was discovered that raw sewage was leaking into Fulton Creek. This problem was corrected by the City of Edmonton in midsummer, and fecal coliform counts in right-bank samples decreased from 9500/100mL on August 23, 1983, to 80/100mL on September 20, 1983. Indicator bacteria counts in left-bank samples in this vicinity were also quite high; combined sanitary and storm sewers were probably the source.

At the next sampling location, immediately downstream of Beverly Bridge, right-bank samples were collected within the effluent plume of GBWTP. All TC counts in samples from this site exceeded 2400 TC per 100 mL, as did most of the counts from centre-channel samples.

Left-bank FC values at Beverly Bridge were significantly lower than left-bank FC values at 50th Street Footbridge ($P<0.05$, $n = 21$), suggesting die-off or dilution between the upstream source and the Beverly location.

The Clover Bar location, 6 km downstream of the GBWTP outfall, was sampled only in 1982. Median values for indicator and heterotrophic bacteria in right-bank samples were lower than median values from Beverly Bridge right-bank samples, although centre-channel and left-bank values were similar for the two locations. It is likely that the GBWPT outfall plume mixed along the right shore or shifted toward the centre as the river flowed around the large bend between the two sampling locations. In spite of this, TC counts in all 1982 right-bank samples exceeded 2400/100mL and FC counts in all but two of twelve 1982 right-bank samples exceeded 200/100mL.

The Fort Saskatchewan sampling location is approximately 24 km below the GBWTP outfall, and is downstream of both the St. Albert municipal lagoon discharge to the left-bank and the City of Edmonton's Bremner lagoon discharge to the right-bank. These discharges contributed to high levels of indicator and heterotrophic bacteria throughout this part of the NSR. Counts exceeded 2400 TC/100mL in 51 of the 57 samples collected at the three sites at this location. Counts in left-bank samples from Fort Saskatchewan were significantly higher than counts in left-bank samples from Clover Bar ($P< 0.001$, $n=12$).

There was no significant difference between 1982 TC counts at the Fort Saskatchewan location and 1982 TC counts at the location immediately downstream of the Sturgeon River - NSR confluence ($P > 0.05$, $n = 10$, centre-channel sites), even though median values for right-bank and centre-channel sites were somewhat higher at the downstream location. The municipal effluent from Fort Saskatchewan may have affected right-bank and centre-channel samples; left-bank TC values were significantly lower than centre-channel values ($P < 0.005$, $n = 11$). The left-bank sampling site may have been within the Sturgeon River plume, because 1983 samples from the Sturgeon River gave comparatively low coliform counts (1983 range: 12 to 3400 TC per 100 mL, < 2 to 400 FC per 100 mL).

In general, bacterial counts in the NSR declined between the Sturgeon River location and the Vinca Bridge location, probably because of die-off and mixing. The Vinca Bridge location is downstream of the mouths of the Redwater River on the left bank and Beaverhill Creek on the right bank; 1983 samples from these streams gave low counts of indicator bacteria. There was little difference in counts from left-bank, centre-channel and right-bank samples for any of the types of bacteria sampled at Vinca, but a high percentage of samples from this location in 1982 and 1983 gave TC counts greater than 2400 per 100 mL.

At Pakan Bridge, median values for indicator and heterotrophic bacteria were slightly lower than at the locations immediately upstream. However, the median TC values from right-bank, centre-channel and left-bank samples were more than 20 times higher than the median TC values from Devon Bridge samples, and FC numbers were nine times higher than at Devon Bridge. A similar ratio was observed for data from the Alberta Environment River Water Quality Monitoring Network for the May to November period, 1978 to 1982, at Pakan. The differences for both TC and FC numbers between Devon and Pakan were significant for both sets of data (this study data 1982-83, $P< 0.001$, $n = 20$; RWQMN data 1978-82 $P< 0.001$, $n = 25$ for TC, $n = 29$ for FC).

14.3 Surface Water Quality Objectives

In the Alberta Surface Water Quality Objectives (ASWQO), there are two categories of criteria concerning bacteriology in surface waters: one concerns water to be withdrawn for treatment and distribution as a potable supply; the other concerns waters used for direct contact recreation or vegetable crop irrigation (Alberta Environment 1977). The latter criteria are used in this report for two reasons: first, the Objectives for contact recreation and/or vegetable crop irrigation are considerably more stringent than those for water to be withdrawn for treatment prior to distribution for domestic use; second, there are no water withdrawals for domestic use from the impacted portion of the NSR study section. The ASWQO criteria for waters used for recreational purposes are:

> "In waters used for direct contact recreation or vegetable crop irrigation the geometric mean of not less than five samples taken over not more than a 30-day period should not exceed 1,000 per 100 ml total coliforms, nor 200 per 100 ml fecal coliforms, nor exceed these numbers in more than 20 percent of the samples examined during any month, nor exceed 2,400 per 100 ml total coliforms on any day." (p. 5, Alberta Environment 1977)

Drinking water quality standards (e.g. Guidelines for Canadian Drinking Water Quality 1978, Department of National Health and Welfare 1979) apply to water used for human consumption, whether the water is disinfected or not. These standards are much more stringent than surface water quality standards, and the two should not be confused.

The bacterial sampling in this study was not carried out in accordance with all ASWQO criteria, especially the requirement for a minimum of five samples in any consecutive 30-day period. Therefore, only Objectives relevant to single samples can be applied strictly to the results obtained. Results for other bacterial groups, such as fecal coliforms (FC) and fecal streptocci (FS), can be used as a general indication of bacteriological water quality.

Bacterial densities were greater than the ASWQO for direct contact recreation in a high percentage of single samples taken in close proximity to major outfalls which contribute to the unnatural bacterial flora of the NSR (Fig. 14.8). Although the percentage of

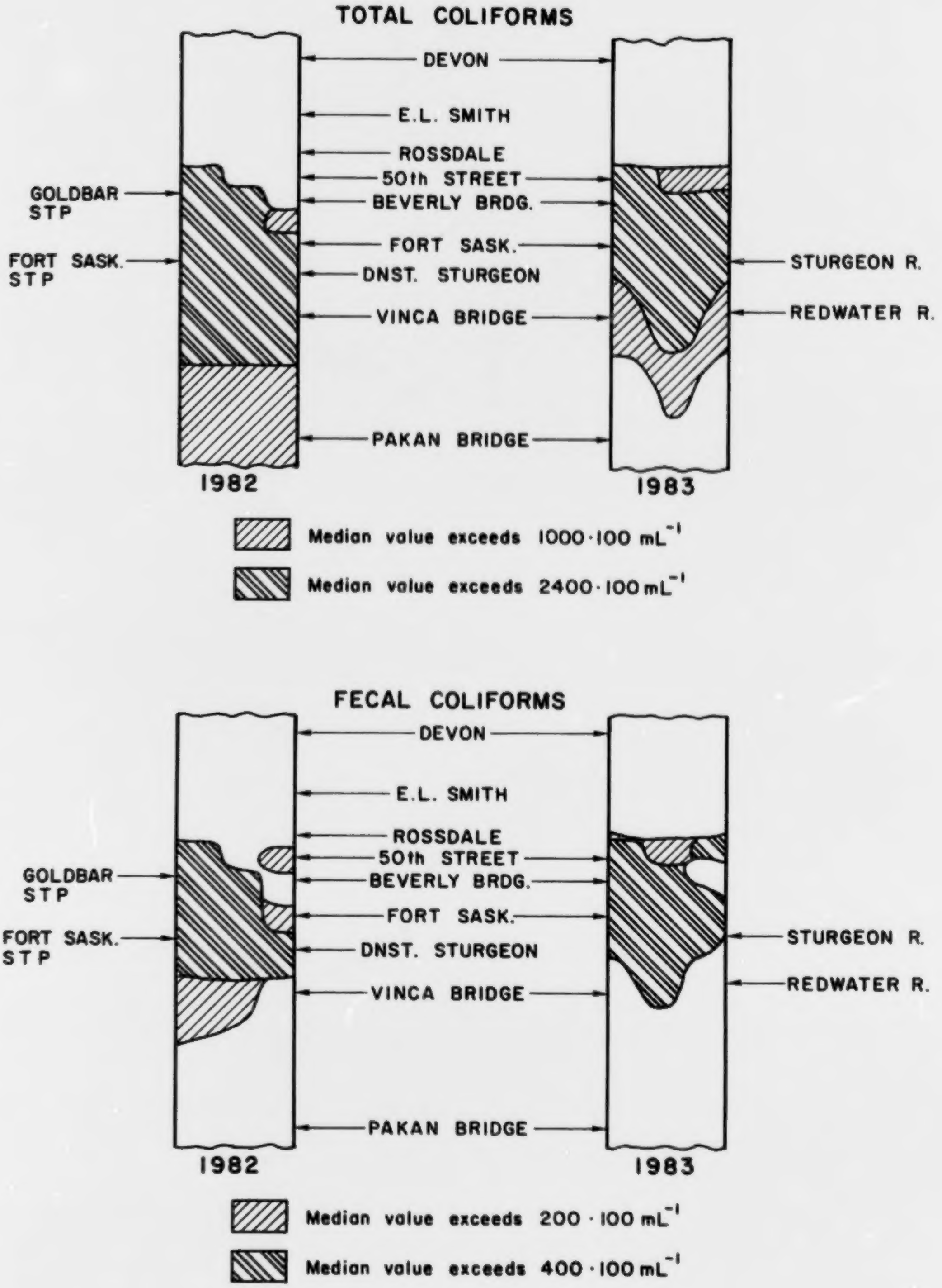

TOTAL COLIFORMS
DEVON
E.L. SMITH
ROSSDALE
50th STREET
BEVERLY BRDG.
FORT SASK.
DNST. STURGEON
VINCA BRIDGE
PAKAN BRIDGE
GOLDBAR STP
FORT SASK. STP
STURGEON R.
REDWATER R.
1982
1983
▨ Median value exceeds 1000·100 mL⁻¹
▧ Median value exceeds 2400·100 mL⁻¹
FECAL COLIFORMS
DEVON
E.L. SMITH
ROSSDALE
50th STREET
BEVERLY BRDG.
FORT SASK.
DNST. STURGEON
VINCA BRIDGE
PAKAN BRIDGE
GOLDBAR STP
FORT SASK. STP
STURGEON R.
REDWATER R.
1982
1983
▨ Median value exceeds 200 · 100 mL⁻¹
▧ Median value exceeds 400 · 100 mL⁻¹

Fig. 14.8 Concentrations of total and fecal coliforms in the North Saskatchewan River.

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

samples complying with the criteria increased in downstream direction, the percentage of compliance remained below 80% at Pakan, where the NSR is considered to be mixed.

Table 14.1 is a summary of TC, FC, and FS median values for Devon and Pakan, the most upstream and downstream locations in the study section of the NSR. For comparison, some data from the Alberta Environment River Water Quality Monitoring Network are included. Table 14.1 also provides a summary of values for these two study locations as they compare to ASWQO.

In general, the bacteriological results indicate that the NSR was unsuitable for contact recreation in the impacted section downstream of the City of Edmonton.

14.4 Impacts

The most sensitive potential uses of the NSR are direct contact recreation and vegetable crop irrigation. However, vegetable production using untreated river water is minimal in the watershed. Most microbiological water quality objectives, including the Alberta Surface Water Quality Objectives, are based on the assumption that health risks to swimmers, water skiers, and other participants in direct water contact recreation, are unacceptable when bacterial counts exceed the specified limits. This assumption stems from studies which associate gastrointestinal, nose, and throat illnesses with high levels of TC and FC. Densities of TC and FC usually exceeded ASWQO criteria in the section of the NSR between and

TABLE 14.1 Total and fecal coliforms and fecal streptococci in samples from Devon and Pakan, 1978-1983 median values, May to November, 1978-1983, and comparison with Alberta Surface Water Quality Objectives.

	Devon (n)	Pakan (n)		
RWQMN** 1978-82				
TC	13 (27)	490 (25)		
FC	4 (32)	40 (29)		
FS	8 (18)	30 (19)		
% of samples complying with A.S.W.Q.O.*:	100%	73%		
this study 1982-83	Composite	Left Bank	Centre	Right Bank
TC	56 (21)	1400 (20)	1100 (19)	1300 (21)
FC	10 (21)	105 (20)	96 (19)	88 (21)
FS	18 (21)	45 (20)	39 (19)	42 (21)
% of samples complying with A.S.W.Q.O.*:	100%	36%	79%	71%

* Alberta Surface Water Quality Objectives (Alberta Environment 1977) recommend a maximum of 2400 $TC \bullet 100mL^{-1}$ on any one day for direct contact recreation; not more than 20% of the samples in any month should exceed 1000 TC per 100 mL of sample or 200 FC per 100 mL of sample; there are no ASWQO for FS.

** Alberta Environment River Water Quality Monitoring Network including 50th Street Footbridge, right-bank site, and Vinca Bridge, centre-channel site (Fig. 14.8).

Some attention has been focussed on the recent detection of antibiotic-resistant bacteria in the NSR (Bell 1983). These bacteria contain genetically transferred R plasmids or R factors, which are circles of DNA separate from the bacterial chromosome. A single R factor may determine resistance to several drugs. R factors can be transferred from one bacterium to another within the human gut, and transfers are enhanced when antibiotics are administered, because the gut environment is altered (Gyles 1984). R-factor transfers are not limited to members of a single species or group of bacteria and, therefore, a relatively innocuous species such as _Escherichia_ _coli_ can transfer resistance to a variety of pathogenic genera, such as _Salmonella_ and _Shigella_. Because large numbers of _E_. _coli_ occur in humans and their feces, this organism may be an important reservoir for R factors. If _E_. _coli_ containing R factors is ingested, transfer of drug resistance to the normal gut flora may occur. This resistance can then be transferred to a pathogenic species months or years later, resulting in a disease that is difficult to treat (Grabow _et_ _al_. 1974).

Transfer of R factors can also occur in feces and in sewage lagoons. In a study of sewage from several Western Canadian cities including Edmonton, Bell _et_ _al_. (1981) found that about 10% of the fecal coliform population in both raw sewage and sewage plant effluent contained R factors. Final effluent tended to have a slightly higher percentage than raw sewage, suggesting a greater survival rate for drug-resistant forms.

In a study of the NSR, Bell (1983) found that the greatest percentage of drug-resistant fecal coliforms occurred in the Edmonton area; no drug resistant fecal coliforms were found in the headwaters. It is not possible to assess health risks or even the importance of the problem in the NSR from this limited data set. There is no concern with drinking water, because treatment would destroy R-factor bacteria.

Although the subject of R-factors and their importance to human health is still a matter of some controversy, the long-term implications are that the percentage of resistant bacteria entering the river would gradually increase through selective pressure on the bacterial population and continued use of antibiotics. Effluent from hospitals and animal-holding facilities where antibiotics are used likely contribute to the spread of R-factor bacteria. Since indicator bacteria can potentially contribute to the incidence of human disease through R factor transfer, new water quality standards and improved treatment of sewage effluent may be needed (Grabow et al. 1974).

15.0 BIOCHEMICAL AND CHEMICAL OXYGEN DEMAND (BOD/COD)

Surface waters contain various quantities of organic matter in both dissolved and particulate forms. The organic load carried by surface waters may be increased by the addition of municipal and industrial waste effluents. Organic matter is oxidized into stable inorganic compounds by the aerobic microflora in the aquatic environment and by chemical oxidation.

The biochemical oxygen demand (BOD) is a measure of the oxygen consumed in the oxidation of organic material in water by aerobic microbial decomposition under controlled laboratory conditions, providing there are no toxic substances present to interfere with biological activity. The BOD test is commonly used to assess the potential oxygen requirements of waste discharges entering receiving waters. However, the test may be of limited value as a measure of true oxygen demand in surface waters, because the laboratory setting does not duplicate natural stream conditions for such variables as temperature, sunlight, dissolved oxygen concentrations, water movement, and populations of living organisms (American Public Health Association _et_ _al_. 1980).

The chemical oxygen demand (COD) is a measure of the amount of oxygen required for the chemical oxidization (dichromate oxygen consumption) of organic and inorganic matter in water. COD like BOD indicates the potential for organic material to reduce the dissolved oxygen content in water, although there is not necessarily a correlation between the two measures. In surface waters, COD almost always exceeds BOD (McNeely _et_ _al_. 1979).

In 1982, BOD analyses were conducted at the Gold Bar Laboratory, City of Edmonton (detection limit 0.3 mg•L^{-1}); in 1983, BOD analyses were conducted at the AEC laboratory, Vegreville (detection limit 1.0 mg•L^{-1}). COD determinations were conducted at AEC in both 1982 and 1983. Additional details concerning these methods are referenced in the general methods section.

15.1 Results and Discussion: BOD

Both seasonal and spatial variations were evident in the BOD levels determined within the NSR study section. A spatial analysis (Fig. 15.1) shows that for upstream locations (Devon to the 50th Street Footbridge sites) median BOD values were low, ranging from less than 1.0 mg•L^{-1} to 1.3 mg•L^{-1}. A sharp increase in BOD occurred at the Beverly Bridge right-bank site (median = 2.2 mg•L^{-1}) and right-bank sites as far downstream as Pakan remained at similar levels (medians from 1.5 to 2.2 mg•L^{-1}). Except for a marked increase in BOD at the Rundle Footbridge left-bank site (1.6 mg•$^{-1}$), left-bank sites were near 1.0 mg•L^{-1} as far downstream as Cloverbar, below which BOD increased in downstream direction, reaching concentrations of 2.0 mg•L^{-1} at both Vinca and Pakan.

Seasonal variations in BOD concentrations are presented graphically in Fig. 15.2. At most sites and on most occasions, the highest BOD values were recorded either in spring (May to early June) or in late fall or winter. BOD values in the summer period were usually at their lowest. Exceptions to the lower summer values

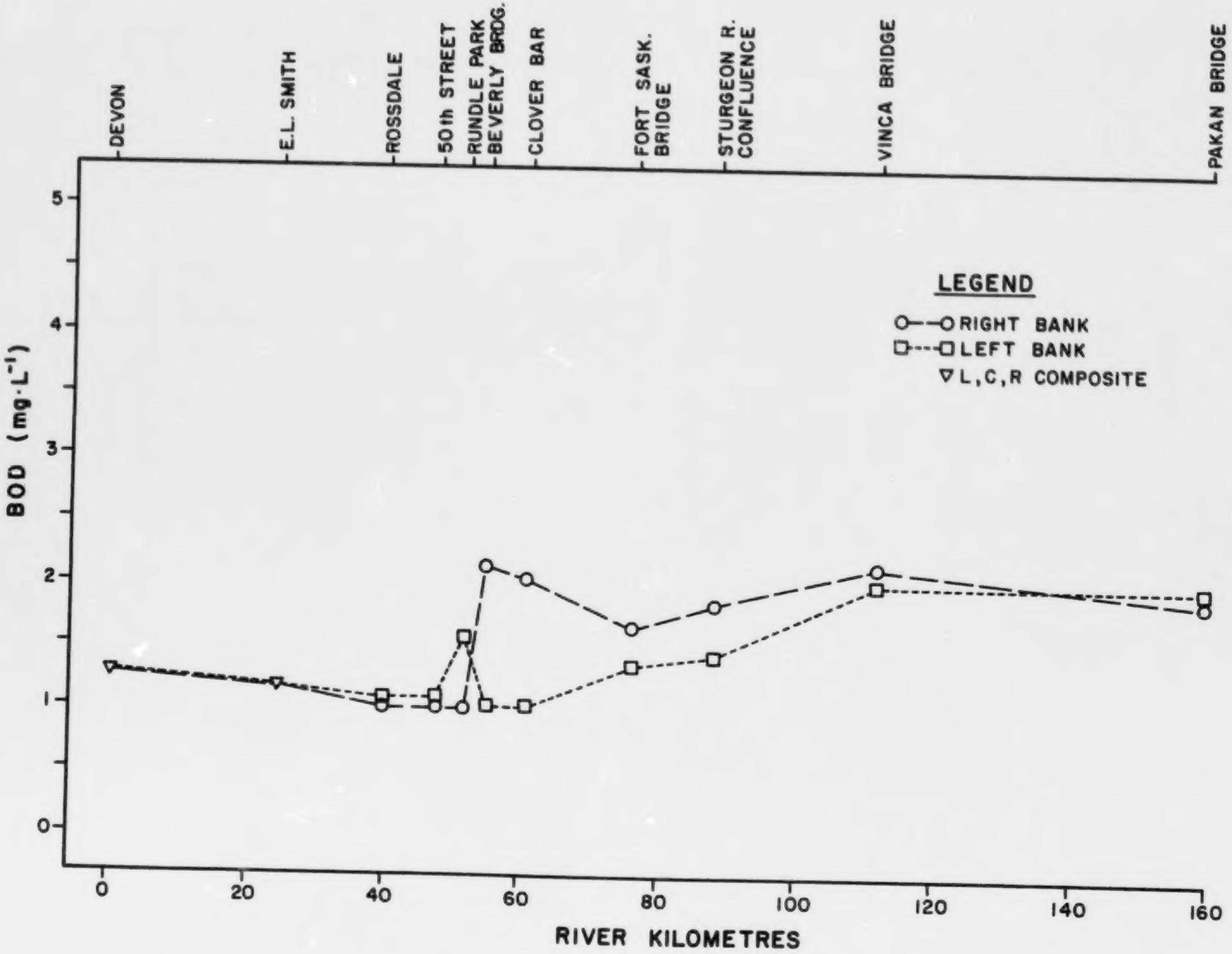


Fig. 15.1 Spatial biochemical oxygen demand (BOD), median values, NSR, 1982-1983.

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

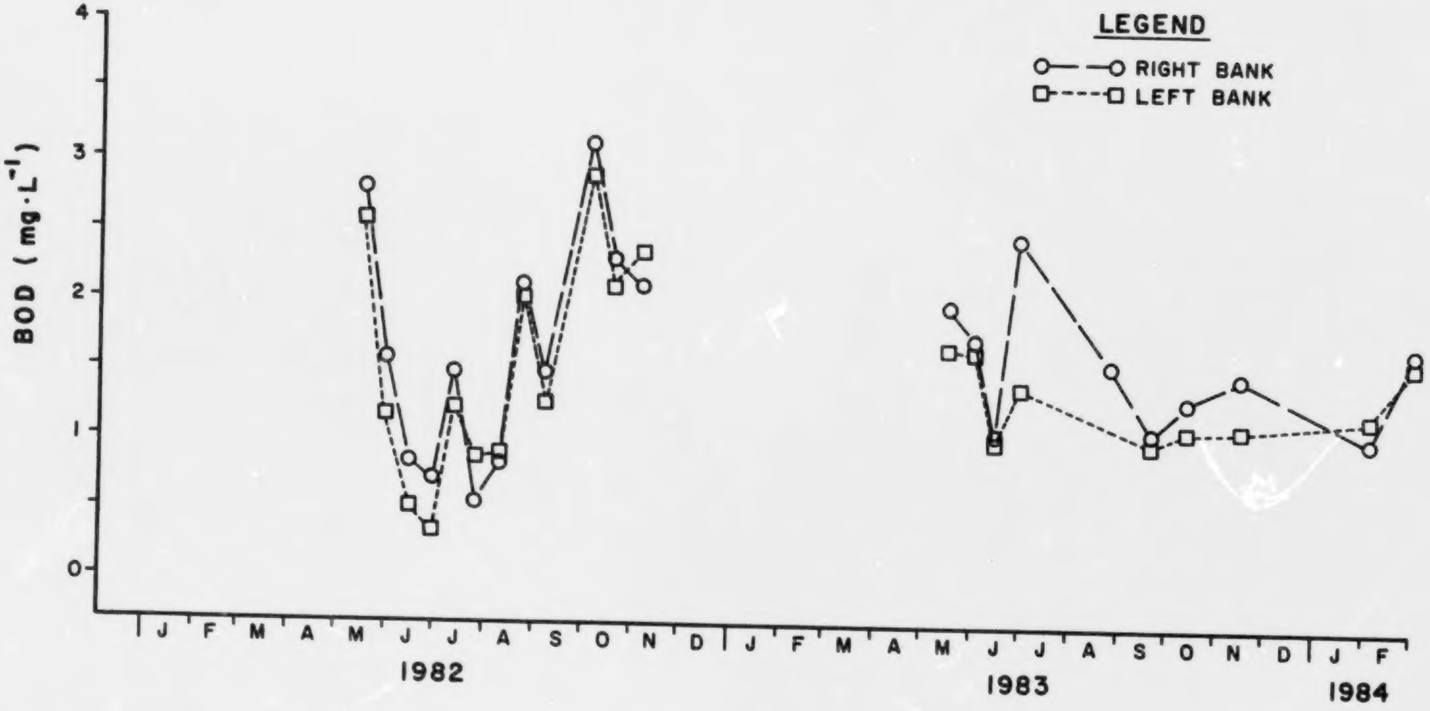


Fig. 15.2 Seasonal biochemical oxygen demand (BOD), median values, NSR, 1982-1983.

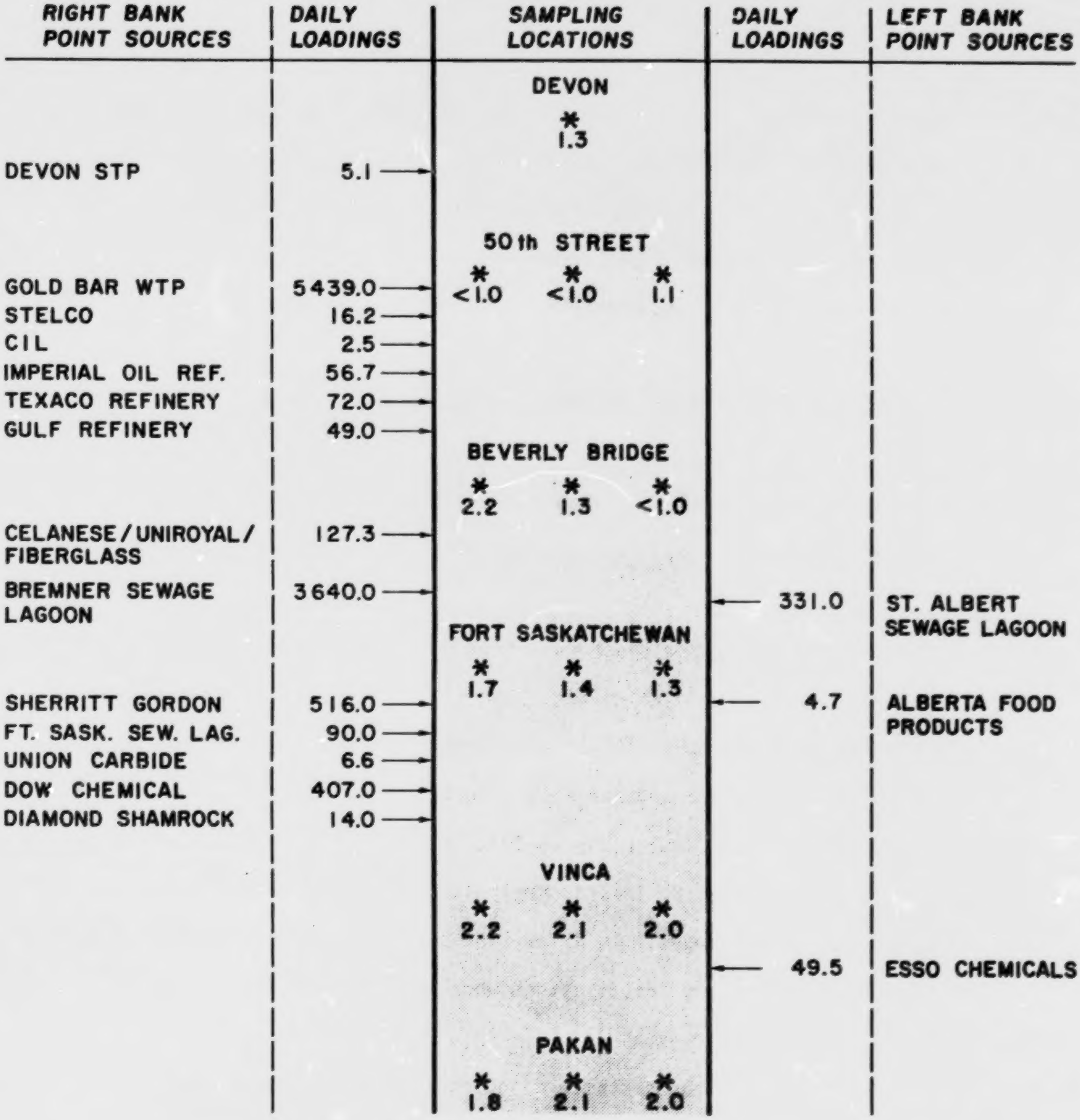
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

occurred on July 13, 1982 and June 28, 1983, when sampling coincided with the high-flow period of each year and when substantial BOD loading from tributaries was recorded. Loading contributions to BOD ($kg{\cdot}d^{-1}$) from the four major tributaries entering the study section of the NSR for two sampling events in 1983 are tabled below:

	Whitemud	Redwater	Beaverhill	Sturgeon	Total
June 28-29/83	5661.	1865.	7872.	3932.	19330.
Sept.20-21/83	6.	20.	1.	69.	96.

Continuous point-source discharges from municipal and industrial facilities contributed an average load of approximately 10,825 $kg{\cdot}d^{-1}$, 88% of which was from municipal discharges of treated sewage, and only 12% of which was from industrial discharges. Therefore, during a high-flow period in 1983 (June 28-29), tributary contributions were approximately 1.8 times as great as were the above continuous point-source discharges. In a low-flow period (Sept.20-21), on the other hand, tributary contributions were less than 1% of continuous point-source discharges.

Based on continuous-source discharges, the right-bank sites from 50th Street Footbridge to Vinca received 96% of total BOD loading (Fig. 15.3), which was consistent with the higher right-bank site median values measured from Beverly Bridge to Vinca. Statistical comparisons between Devon, the upstream location, and all other sites


RIGHT BANK POINT SOURCES
DAILY LOADINGS
SAMPLING LOCATIONS
DAILY LOADINGS
LEFT BANK POINT SOURCES
DEVON
* 1.3
DEVON STP 5.1
50th STREET
* <1.0 * <1.0 * 1.1
GOLD BAR WTP 5439.0
STELCO 16.2
CIL 2.5
IMPERIAL OIL REF. 56.7
TEXACO REFINERY 72.0
GULF REFINERY 49.0
BEVERLY BRIDGE
* 2.2 * 1.3 * <1.0
CELANESE / UNIROYAL / FIBERGLASS 127.3
BREMNER SEWAGE LAGOON 3640.0
331.0 ST. ALBERT SEWAGE LAGOON
FORT SASKATCHEWAN
* 1.7 * 1.4 * 1.3
SHERRITT GORDON 516.0
4.7 ALBERTA FOOD PRODUCTS
FT. SASK. SEW. LAG. 90.0
UNION CARBIDE 6.6
DOW CHEMICAL 407.0
DIAMOND SHAMROCK 14.0
VINCA
* 2.2 * 2.1 * 2.0
49.5 ESSO CHEMICALS
PAKAN
* 1.8 * 2.1 * 2.0

TOTAL INDUSTRIAL LOAD = 1321.5
TOTAL MUNICIPAL LOAD = 9505.1
TOTAL DAILY LOAD = 10826.6

Fig. 15.3 Diagrammatic representation of 1982-84 median BOD concentrations ($mg \cdot L^{-1}$) and estimated municipal and industrial point source loadings ($kg \cdot d^{-1}$) .

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

sampled during the study period show that Beverly Bridge right-bank, Vinca left-bank, centre-channel and right-bank, and Pakan left-bank sites had significantly higher BOD values than Devon ($P<.05$, n = 19, 19, 15, 19 & 14, respectively). Fort Saskatchewan left-bank, centre-channel, and right-bank sites and Pakan centre-channel and right-bank sites were not significantly different from Devon ($P<.05$, n = 14, 13, 13, 16 & 18, respectively). The BOD values for 50th Street Footbridge centre-channel and right-bank sites and Beverly Bridge left-bank sites were significantly lower than Devon ($P<.05$, n = 16, 18, 15, respectively); many of the very low values are near the detection limit, and no special importance should be attached to the low BOD values at these three sites.

15.2 Surface Water Quality Objectives: BOD

The Alberta Surface Water Quality Objectives (Alberta Environment 1977) suggest that BOD must not exceed a limit which would create a dissolved oxygen content in receiving waters of less than 5 $mg{\cdot}L^{-1}$. No specific Canadian guidelines for BOD have been proposed. Waters with BOD levels below 4 $mg{\cdot}L^{-1}$ are considered reasonably clean, whereas waters with levels greater than 10 $mg{\cdot}L^{-1}$ are considered polluted (McNeely et al. 1979). In the publication "Quality Objectives for Aquatic Life in European Fresh Waters", Baudo et al. (1978) recommend a "highest quality objective" of 5 $mg{\cdot}L^{-1}$ or less, and a minimum quality objective of 8 $mg{\cdot}L^{-1}$.

Of 461 BOD tests done on NSR water in this study, 439 (or 95.2%) were less than 4 mg•L^{-1}; none exceeded 10 mg•L^{-1}. At the upstream locations from Devon to Rundle Footbridge and the Beverly Bridge left-bank and centre-channel sites, BOD values were at all times less than 4.0 mg•L^{-1}. The small number of BODs which were over 4.0 mg•L^{-1} occurred primarily at right-bank sites from Beverly Bridge to Pakan. At Pakan, 51 of 55 tests (92.7%) were under 4.0 mg•L^{-1}. The few high BOD values occurred either in the spring (May) or late fall and winter (Oct., Nov., Feb.).

15.3 Results and Discussion: COD

COD values showed less spatial variation than BOD values (Fig. 15.4). Except for the Sturgeon River (9) left-bank site (median = 24 mg•L^{-1}), which was sampled in the NSR immediately below the confluence with the Sturgeon River, median COD values ranged from 9.0 to 16.5 mg•L^{-1}. Statistical comparisons between Devon and all other locations except Sturgeon River sampled over the entire 1982-84 period showed no significant differences between sites ($P<.05$, $n = 20$).

Seasonally, the highest COD values usually occurred during high flow periods. Municipal discharges of treated sewage makeup 83% of COD loading from continuous sources, and industrial discharges makeup the remaining 17% (Fig. 15.5).

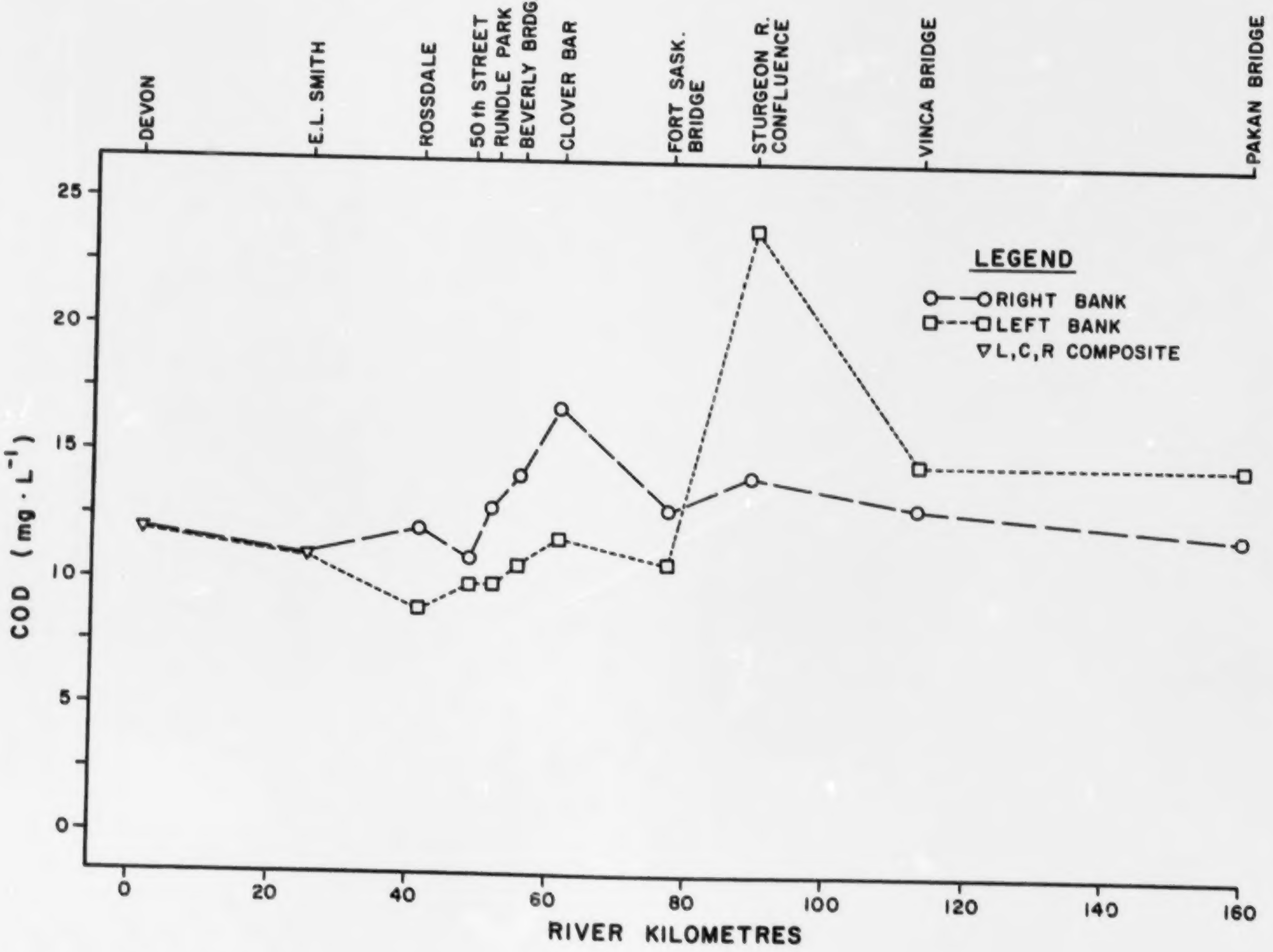
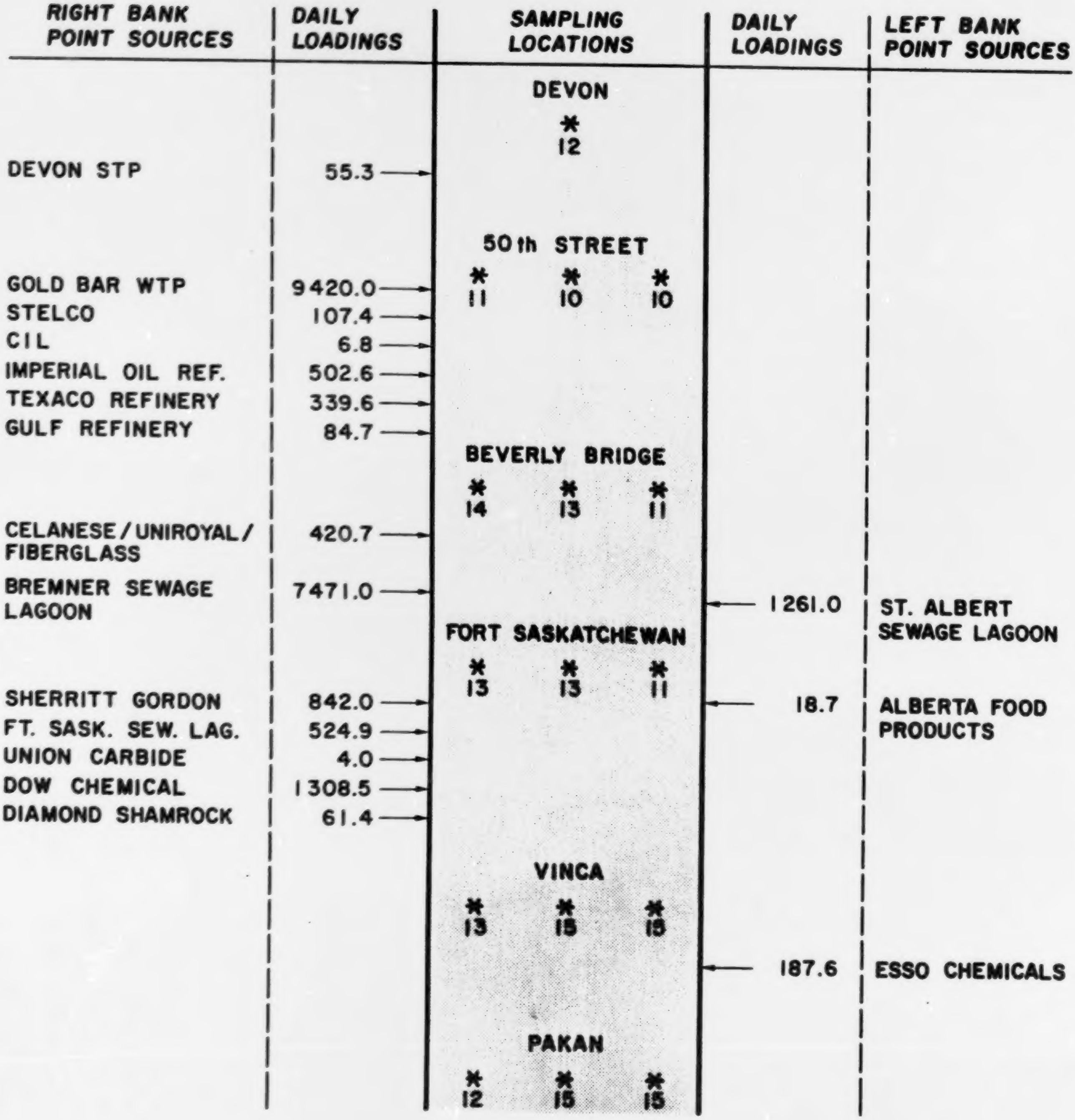


Fig. 15.4 Spatial chemical oxygen demand (COD), median values , NSR , 1982-1983 .

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch


RIGHT BANK POINT SOURCES
DAILY LOADINGS
SAMPLING LOCATIONS
DAILY LOADINGS
LEFT BANK POINT SOURCES
DEVON
* 12
DEVON STP
55.3
50th STREET
* 11
* 10
* 10
GOLD BAR WTP
9420.0
STELCO
107.4
CIL
6.8
IMPERIAL OIL REF.
502.6
TEXACO REFINERY
339.6
GULF REFINERY
84.7
BEVERLY BRIDGE
* 14
* 13
* 11
CELANESE/UNIROYAL/FIBERGLASS
420.7
BREMNER SEWAGE LAGOON
7471.0
1261.0
ST. ALBERT SEWAGE LAGOON
FORT SASKATCHEWAN
* 13
* 13
* 11
SHERRITT GORDON
842.0
18.7
ALBERTA FOOD PRODUCTS
FT. SASK. SEW. LAG.
524.9
UNION CARBIDE
4.0
DOW CHEMICAL
1308.5
DIAMOND SHAMROCK
61.4
VINCA
* 13
* 15
* 15
187.6
ESSO CHEMICALS
PAKAN
* 12
* 15
* 15

TOTAL INDUSTRIAL LOAD = 3884.0

TOTAL MUNICIPAL LOAD = 18732.2

TOTAL DAILY LOAD = 22616.2

Fig. 15.5 Diagrammatic representation of 1982-84 median COD concentrations ($mg \cdot L^{-1}$) and estimated municipal and industrial point source loadings ($kg \cdot d^{-1}$) .

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

15.4 Surface Water Quality Objectives: COD

No Canadian water quality guidelines for COD have been proposed. In "Quality Objectives for Aquatic Life in European Fresh Waters" (Baudo *et al*. 1978), a maximum quality objective equal to or less than 10 mg•L and a minimum quality objective equal to or less than 30 mg•L^{-1} is prescribed. The former objective implies a standard compatible with negligible human influence on the ecosystem; the latter refers to the minimum standard necessary to maintain a self-sufficient microbial flora capable of the aerobic decomposition of organic material present in the water.

Not surprisingly, the COD in the NSR fell short of the maximum quality objective. However, COD values rarely approached the minimum objective, and then only in outfall areas (e.g. near confluence with the Sturgeon River). In the downstream parts of the study section of the NSR (e.g. Vinca or Pakan), where mixing is nearly or totally complete, median COD values were well below the minimum objective.

15.5 Impacts: BOD and COD

Most of the year and throughout most of the study section of the NSR, BOD and COD levels indicated a low to moderate organic load in the river. These levels, together with the dissolved oxygen levels actually recorded, indicate that the impact of the organic load on the biotic community is low to moderate.

At certain times of year (mainly for COD during high flows) or in certain river sections receiving large effluent volumes (mainly for BOD), elevated BOD and COD levels were indicative of higher oxygen consumption for the oxidation or decomposition of the organic materials carried by the NSR. It is at these times or places where higher organic loads in future could have a negative impact. Reductions in tributary BOD and COD contributions to the NSR during periods of high flow should result from the completion of the Capital Region Sewage Treatment Plant and the Southeast Regional Trunk Sewer (see Section 2.10).

High BOD or COD levels within prescribed limits could have incipient negative effects when combined with the effects of other variables also approaching surface water quality objective limits. However, little information is available on the synergistic effects of several variables under a variety of climatic and flow conditions.

16.0 SUMMARY

The following summary highlights the major findings and most salient features of the various sections of the report. The appropriate sections of the report are cross-referenced by number for the reader's convenience.

Purpose and Scope (Sections 1.0, 4.0)

A study of the section of the North Saskatchewan River impacted by the greater Edmonton metropolitan area was undertaken in 1982 and 1983 for the purpose of characterizing this section of the river chemically and biologically, assessing certain variables against the Alberta Surface Water Quality Objectives, and appraising actual and potential impacts from pollutants entering this section of the river.

The main emphasis in similar studies has been on water chemistry, which is of limited interpretive value. For instance, the chemistry of flowing water tends to represent a momentary situation and does not reflect either the synergistic effects of two or more variables, or the cumulative effects of variables over a considerable period of time. In the present study, therefore, considerable attention was paid to certain biological components, especially those which act as integrators of environmental conditions.

Sites were selected throughout the study section to represent the relatively unimpacted upstream conditions, the fairly well mixed downstream portion which begins to show some evidence of "recovery", and intermediate sites which would reflect known or suspected sources of impact.

Flows (Section 2.4)

This study was planned to span a minimum of two years, because no one year is likely to be completely representative of normal conditions. Total annual discharge in 1982 was much greater than the historical average, but most of this was due to flows greater than twice normal in July; flows during the other months were near or sometimes below normal. Total annual discharge in 1983 was somewhat below normal; flows were below normal for all months from May to October, inclusive, especially for June and July.

Mixing (Section 3.0)

No new investigation of mixing in the North Saskatchewan River was carried out during this study. A review of existing data indicates poor mixing for at least 70 km downstream of Edmonton (i.e. to Vinca). Previous studies and data from the present report indicate that mixing is probably fairly complete most of the year at Pakan, the most downstream study location.

Temperature (Section 6.0)

North Saskatchewan River water temperatures in the study section ranged from 0°C in winter to about 25°C in summer. The mean increase in water temperature between Devon and Pakan (the most upstream and most downstream locations in this study) for all study dates was less than 1°C. Within the plumes from heated effluent sources, temperature differences can be somewhat greater, as indicated by the open-water stretches in the study section in winter. However, site-to-site differences after some mixing had occurred were below the ASWQO of 3°C rise. This temperature difference in itself is seen to have a more positive than negative impact (e.g. would enhance aeration in winter). Other potential synergistic effects are discussed below.

Dissolved Oxygen (Section 7.0)

During most of the year, dissolved oxygen was near or above saturation levels throughout the study section of the North Saskatchewan River. In general, variations in dissolved oxygen were seasonal rather than spatial. Lowest levels, from about 65% to 85% saturation, were noted at two different times of year - midwinter (February) and midsummer (July). There were seldom significant differences in site-to-site or bank-to-bank values. At all times during this study, dissolved oxygen complied with the ASWQO of a minimum of 5 $mg \cdot L^{-1}$. There were no apparent direct impacts due to the somewhat lower midwinter and summer dissolved oxygen levels. Potential synergistic effects are discussed below.

Major Ions (Section 8.0)

Concentrations of major ions were usually lowest during high-flow periods in the North Saskatchewan River (especially during spring and early summer runoff periods) and highest during low-flow periods (especially in August, but also in mid-winter). For non-filterable residue, the reverse relationship usually prevailed: non-filterable residue was generally higher during high-flow periods and lower during low-flow periods.

There was no change in the pattern of ionic dominance from Devon to Pakan, although there was a slight increase (<10%) in the concentration of most ions in downstream direction. The exceptions were sodium, chloride, and potassium ions, which all had significantly higher concentrations at Pakan.

An analysis of concentrations at various sites and loading by tributaries and effluents showed that municipal discharges were the main source of sodium and chloride loads, with tributaries contributing relatively more sodium than chloride to the loads, and industrial sources contributing about 18% of the median sodium load and about 29% of the median chloride load. For potassium, the largest contribution came from tributaries, considerably less from municipal sources, and only about 3% from industrial sources.

There are no ASWQO for most major ions included in this study. This is partly because concentrations of these ions are extremely variable in natural waters, and partly because they are usually considered harmless, even at much higher concentrations than occur naturally in most Alberta surface waters.

The ASWQO for non-filterable residue is difficult to apply to a river in a developed basin. However, on the basis of upstream-downstream comparisons, the objective was exceeded in nearly 25% of the samples collected during the study period. Most of these exceedences occurred during high runoff periods and seem to have storm sewers as their principal source.

No impacts are believed attributable to changes in major ion concentration throughout the study section of the North Saskatchewan River. The main impacts of elevated levels of non-filterable residue are likely to be on the biota as a result of increased turbidity and associated reduction in light penetration, of habitat fouling through increased sedimentation, and of scouring enhancement during periods of high water.

Metals (Section 9.0)

Of the sixteen metals for which analyses were performed, six (including mercury) were consistently below the detection level throughout the study. Four metals were consistently above the analytical detection limit but showed little seasonal or spatial variation; all were below the limits prescribed by the ASWQO. Iron and aluminum were well above detection levels and their occurrence is linked to seasonal events (i.e. high concentrations at high river flows). Nickel and lead were also present well above detection limits and the pattern of occurrence was spatial, implying point sources. Changes in zinc concentrations were rather sporadic, although there was some evidence of spatial change. Manganese, also present well above the detection level, showed both seasonal and spatial changes, suggesting links to both natural occurrence and point sources.

The natural levels of three metals (iron, manganese, zinc) approached or exceeded the ASWQO. However, none is considered a health hazard at the levels determined in this study. There are no Objectives for aluminum and nickel, but again, neither is considered a health hazard at the levels determined. The source of aluminum is natural; nickel occurrence was linked to industrial discharge. Lead values occasionally exceeded the ASWQO, usually in unmixed sections of the river, and the source of the lead was linked to storm sewers. The principal source is probably automobile emissions, and the lead enters the storm sewers via urban surface runoff.

No identifiable impacts have been associated with metals at the levels detected in the study section of the North Saskatchewan River in 1982 and 1983.

Organics (Section 10.0)

No detectable levels of chlorinated pesticides, chlorinated herbicides, organophosphorus or organonitrogen compounds, or PCB's were found in the North Saskatchewan River samples in this study. The occurrence of acid and base/neutral fractions and purgeable priority pollutants near or below the analytic detection limit suggests that these compounds are not an imminent threat to water users. No surface water quality standards have yet been set for the latter group of compounds.

The concentration of total phenolic compounds in North Saskatchewan River samples only rarely exceeded the ASWQO of 0.005 $mg \cdot L^{-1}$. Of the few high values, most were in unmixed sections of the North Saskatchewan River below point sources. Some phenolic compounds are likely of natural origin, but much of the total concentration undoubtedly derives from municipal and industrial point sources in the Edmonton region. At the levels detected, it is likely that the greatest impact of phenolics would be organoleptic (i.e. affecting taste and odor).

Most other organics identified occurred at very low concentrations and in no clear pattern. Surface water quality standards have not been set for most of these compounds. For others, there were occasional exceedences, but most of these were isolated occurrences.

Nutrients (Section 11.0)

Total phosphorus in the North Saskatchewan River varied both seasonally and spatially. Seasonal high concentrations were associated with peak flows, when most of the total phosphorus was in the particulate form and was unlikely to be available to plants for growth. Higher total phosphorus values downstream than upstream were attributable to point-source discharges, primarily municipal wastewater treatment plants on the right bank. Much of the elevated total phosphorus load at downstream locations was in a biologically available form.

The ASWQO for total phosphorus were exceeded in 85% to 95% of the downstream samples during this study, both in mixed and unmixed sections of the North Saskatchewan River. The much lower fraction (20%) of exceedences at the upstream locations occurred during high-flow periods and was due primarily to naturally occurring biologically unavailable phosphorus.

No toxic or organoleptic effects can be attributed directly to the levels of total phosphorus occurring in the NSR. Because a considerable fraction of the total phosphorus downstream of Edmonton was in the biologically available form, plant growth has been enhanced. During the study period, this growth was mainly in the form of epilithic and other attached algae.

No clear seasonal pattern for total nitrogen in the mainstream NSR was evident. In general, upstream locations showed rather low concentrations of all forms of nitrogen. However, elevated levels of total nitrogen occurred in certain tributaries during runoff periods, especially during June and July. The spatial pattern for total nitrogen was similar to that for total phosphorus: high levels of total nitrogen entering the NSR on the right bank between 50th Street Footbridge and Vinca Bridge produced median concentrations at downstream locations three to five times higher than those at upstream locations.

The ASWQO for total nitrogen were exceeded in 24% of the samples in 1983, mainly from right-bank sites within Edmonton City limits and at downstream locations. Most of the load contributing to these exceedences comes from municipal wastewater treatment plant effluents in the greater Edmonton area.

No toxic or organoleptic effects can be attributed directly to the levels of total nitrogen which occurred in the NSR. However, the levels determined were well above those limiting plant growth. When neither nitrogen nor phosphorus is limiting in rivers, excessive algal development can be expected to occur.

Given the appropriate combination of factors, extensive macrophyte development could occur at the nutrient levels determined for the NSR. This is discussed at greater length below.

Chlorophyll-a (Section 12.0)

Potamo-phytoplankton chlorophyll-a is a measure of the biomass of the "planktonic" algae in the river; epilithic chlorophyll-a is a measure of the biomass of attached algae. Both planktonic and epilithic chlorophyll-a increased significantly in the NSR below major nutrient sources within and downstream of the City of Edmonton. Prior to the conclusion of this study, neither planktonic nor epilithic algae had reached levels causing major concern. However, it is likely that enhanced algal growth and the nuisance factors associated with it could result from any increase in nutrients in future, or from a continuation of current nutrient levels in combination with certain other conditions, such as increased clarity and reduced scouring, which could occur if spring runoff peaks and summer flows were much lower than normal. No surface water quality objectives have been set for chlorophyll-a.

Carbon (Section 13.0)

Values for dissolved inorganic carbon showed no clear spatial or temporal patterns in the study section of the NSR; these values were virtually unaffected by municipal, industrial, or tributary inputs. Although there are no ASWQO for dissolved inorganic carbon, the levels determined in this study fell well within the limits set out by other major drinking and surface water quality guidelines.

Highest total organic carbon values tended to occur when river flows were highest; the particulate organic load was associated with surface runoff, much of which was upstream of the study area, whereas the dissolved fraction was clearly associated with municipal and industrial discharges and tributaries. Dissolved organic carbon values were highest at right-bank sites beginning downstream of the Gold Bar Wastewater Treatment Plant. There was no clear relationship between particulate carbon and discharges from municipal or industrial facilities. However, total organic carbon values were nearly twice as high at Vinca Bridge as at the 50th Street Footbridge, indicating considerable organic enrichment. There are no ASWQO for organic carbon.

Total organic carbon loads have a direct impact on the biochemical oxygen demand (BOD) of surface waters. Particulate organic matter, usually high in organic carbon, serves as food for bacteria and for many invertebrate species. Both groups of organisms tend to increase in numbers in direct response to elevated levels of particulate organic matter.

Bacteria (Section 14.0)

In general, numbers of bacteria in the NSR tended to decline as a result of dilution during high flow periods. Although the reverse relationship occurred at Devon, total numbers of bacteria were usually much lower at this upstream location. Below the Gold Bar Wastewater Treatment Plant, especially on the right bank, total coliforms, fecal coliforms, fecal streptococci, and heterotrophic bacteria counts increased by as much as two orders of magnitude over Devon levels. The counts for most bacterial forms tended to remain high or even to increase as additional effluents from wastewater treatment plants entered the NSR between Gold Bar and Fort Saskatchewan. During the warmest time of year, there was an obvious die-off effect at the most downstream location, although total numbers of bacteria were still high. Because of mixing and natural die-off, both total numbers and bank-to-bank differences tended to decline at Pakan, the most downstream study location.

Total coliform and fecal coliform counts at Devon complied with the ASWQO for direct contact recreation. Although 65% to 79% of all samples complied with the Objectives at Pakan, exceedences were 100% in close proximity to major wastewater treatment plant outfalls.

Biochemical and Chemical Oxygen Demand (Section 15.0)

If median biochemical oxygen demand (BOD) values are considered, there is an approximate doubling of loading between Devon and Pakan, with most of the increase attributable to right-bank discharges from municipal wastewater treatment plants from the 50th Street Footbridge to Fort Saskatchewan. The seasonal patterns of biochemical oxygen demand were different in the two study years: in 1982, there was a spring peak, an early summer decline due largely to dilution, and a late summer and early fall increase; in 1983, early summer peak flows were much below normal, and biochemical oxygen demand values remained fairly constant throughout the year. Winter values were moderately high both years.

ASWQO state that the biochemical oxygen demand must not exceed a level which would result in a dissolved oxygen concentration of less than 5 $mg{\bullet}L^{-1}$. Dissolved oxygen was never measured at less than 5 $mg{\bullet}L^{-1}$ during the course of this study. Other standards suggest that biochemical oxygen demand values under 4 $mg{\bullet}L^{-1}$ are indicative of clean water, whereas values over 10 $mg{\bullet}L^{-1}$ are indicative of polluted waters. In this study, fewer than 5% of all biochemical oxygen demand samples exceeded 4 $mg{\bullet}L^{-1}$ and none exceeded 10 $mg{\bullet}L^{-1}$.

Chemical oxygen demand (COD) values were usually highest during high flow periods, suggesting that much of the chemical oxygen demand was associated with surface runoff or had natural sources. Of that part of the chemical oxygen demand load attributable to continuous point sources, 83% came from wastewater treatment plant effluents.

There are no ASWQO or other Canadian water quality guidelines for chemical oxygen demand. A comparison with other available objectives showed that the North Saskatchewan River fell short of maximum objectives (i.e. near pristine conditions), but only rarely approached minimum objectives (i.e. minimum conditions permitting the survival of a microbial flora capable of decomposing organic matter aerobically).

Zoobenthos (This part of the Summary refers to the material presented in Part Two of this report. It is included here for the reader's convenience).

A study of the water quality of the NSR as reflected by the zoobenthos or benthic invertebrates was initiated in the spring of 1982. Its primary objectives were the characterization of the river as it passes through the Edmonton area, and the identification of the degree of impact from urban development. Another objective was to evaluate complementary zoobenthic studies as integrators of water quality and as aids to the interpretation of chemical and physical data. Benthic invertebrate samples were collected in spring, summer, and fall 1982 at 11 locations from Devon to Pakan for both left-bank and right-bank sites.

The results of multivariate analyses (cluster and principal component analyses) and an evaluation of commonly used community parameters (total numbers, Shannon-Wiener diversity, distribution of numbers among taxa at each site, and distribution of numbers among sites for each major taxon) led to the identification of three major groups of sites. These groups represent zones of different water quality in the river.

Zone I was a group of sites which were located upstream of major point-source effluents. Benthic invertebrates were virtually unimpacted and the invertebrate assemblage was indicative of river water of high quality. The zoobenthos was characterized by relatively low total numbers and by high values for the Shannon-Wiener diversity. Taxa such as Ephemeroptera, Plecoptera, and Trichoptera (known to be intolerant of high organic loads), were as important numerically as more tolerant taxa.

Zone II was an impacted group of sites located downstream of the major point-source discharges in the Edmonton area. Total benthic invertebrate numbers were much higher than in Zone I and tolerant taxa were numerically dominant. Diversity index values dropped.

Zone III was a group of sites showing some recovery and situated downstream of Zone II. Total invertebrate numbers remained much higher than in Zone I, but the zoobenthic assemblages of Zone I and Zone III had features in common, as shown by similar diversity values and similar distributions of numbers among major taxonomic groups.

Municipal and industrial point-source discharges were responsible for the existence of zones of different water quality in the NSR from Devon to Pakan. The relative length of each zone at different times of the year was influenced by the flow rates and the water temperature regime.

Municipal discharges (wastewater treatment plant effluents, storm and combined sewer effluents) are the main contributors to the nutrient and total organic loads of the NSR. Certain invertebrate taxa responded to these point-source discharges by increasing in numbers. The magnitude and consistency of this type of response was greatest below the Gold Bar Wastewater Treatment Plant. The impact from storm and combined sewer effluents was most evident during summer and fall. During periods of heavy runoff, combined sewers known to discharge a mixture of sewage and surface runoff into the NSR induced a much sharper increase in invertebrate density than did storm sewers which discharged primarily surface runoff into the river.

Specific impacts of industrial discharges were masked by the enrichment effects of the Gold Bar Wastewater Treatment Plant. There were no consistent indications of an overall toxic effect in the study area delimited by the Devon and Pakan bridges. Enrichment, particularly below Fort Saskatchewan, had a greater impact on benthic invertebrates. However, the purpose of this study was to assess the integrated impact of all effluents on the water quality of a given section of the NSR, not to measure the impact of industrial point-source effluents.

Seasonal differences in water temperatures and flow rates explained the differences in the relative lengths of Zone II and Zone III in spring and fall. Biological and chemical breakdown processes take place more rapidly at higher temperatures, provided that dissolved oxygen levels are adequate. The NSR had satisfactory dissolved oxygen levels throughout the year in 1982, which permitted benthic invertebrates to recover faster below point-source effluents in the fall than in the spring. The faster recovery in the fall of

1982 was undoubtedly related to the scouring or cleansing process which accompanied the unusually high discharge in the spring of that year. Invertebrate data suggested the existence of a cyclic and dynamic pattern whereby the river bed is cleaned by scouring if spring peak discharges are adequate, and gradually enriched and fouled in downstream direction during summer and fall by discharges from the Edmonton urban area.

Synergistic Effects

The water quality and biota of the NSR downstream of the major sources of impact in the greater Edmonton area are unlikely to be affected in simple and entirely foreseeable ways as a result of significant and concurrent changes in several variables. Few, if any, factors are likely to act in isolation from other factors; the combined effect is the result of synergism and may or may not be readily predictable.

The absence or reduced intensity of the spring runoff peak in the NSR in any given year would result in a reduction in the scouring affect which normally occurs. High flow velocities and scouring usually remove attached plants from fixed substrates and wash loosely deposited sediments from the riverbed, affecting plant, invertebrate animal, and bacterial communities, as well as chemical variables. For instance, the development or recovery of certain plant communities in summer may be much faster and more extensive if spring runoff is greatly reduced in one or a succession of years.

Smaller river discharges in summer can result in greater water clarity, better light penetration, and warmer water temperatures. Similarly, smaller river discharge volumes in the NSR can cause higher concentrations of dissolved substances, such as nutrients, which come from various continuous municipal or industrial effluents in the Edmonton vicinity. One visible result of this combination of factors could be a marked increase in the growth of plants, such as epilithic algae and macrophytes.

The combined effects of reduced scouring, and increased water clarity and nutrient concentrations could be quite dramatic, even if nutrient loadings were near or below average. Consequently, it is possible to foresee a set of circumstances wherein a moderate reduction in nutrient loading would fail to produce the desired effects, at least in the short term. Conversely, an increase in nutrient loading could be masked during years of high spring and summer flow.

An extensive data base covering a period of years is basic to the assessment and prediction of impacts in a river like the NSR.

17.0 PERSONAL COMMUNICATIONS

S. Banerjee, Water and Sanitation, City of Edmonton Gold Bar Wastewater Treatment Plant (August 1985).

D. Barton, Planning Division, Alberta Environment, Edmonton (1985).

W. Culshaw, Town Engineer. Devon, Alberta (August 1985).

F. Daskewech, Project Supervisor, Fort Saskatchewan, Alberta (August 1985).

F. Dieken, Alberta Environment Centre, Vegreville (1985).

H.R. Hamilton, Hydroqual Consultants Inc., Cochrane, Alberta (1985).

L. North, Municipal Engineering Branch, Pollution Control Division, Alberta Environment (1985).

F. Zaal, Alberta District Office, Environment Canada, EPS (May 1985).

18.0 REFERENCES

Alberta Environment. 1977. Surface Water Quality Objectives. Alberta Environment, Standards and Approvals Division and Pollution Control Division, Water Quality Control Branch. 17 p.

Alberta Environmental Centre. 1983a. Chemical residues in fish tissues in Alberta. II. Mercury in the North Saskatchewan River. Alberta Environmental Centre, Vegreville, Alberta. AECV83-R2.

Alberta Environmental Centre. 1983b. Chemical residues in fish tissues in Alberta. III. Pesticides and PCBs in the North Saskatchewan River and Red Deer Rivers. Alberta Environmental Centre, Vegreville, Alberta. 47 p. AECV83-R4.

Allan, J.H. 1984. The fish and fisheries of the North Saskatchewan River Basin. Status and Environmental requirements. Report to Alberta Environment Planning Division. 203 p.

American Public Health Association, American Water Works Association, and Water Pollution Control Federation. 1980. Standard methods for the examination of water and wastewater, 15th edition. American Public Health Association, Washington, D.C. 1134 p.

Baudo, R., R.DeBernardi, G. Giussani, E. Grimaldi, and L. Tonolli. 1978. Quality objectives for aquatic life in European fresh waters. Mem. Ist. Ital. Idrobiol., Pallanza 36 (suppl. 1978): 1-99.

Bayrock, L.A. and G.M. Hughes. 1962. Surficial geology of the Edmonton district, Alberta. Research Council of Alberta, 62-6. 40 p.

Bell, J.B. 1983. North Saskatchewan River survey 1982. Environmental Protection Service, Alberta. Unpublished report. 70 p.

Bell, J.B., W.R. MacRae and G.E. Elliott. 1981. R factors in coliform-fecal coliform sewage flora of the prairies and Northwest Territories of Canada. Applied and Env. Microbiol. 42(2): 204-210.

Beltaos, S., and M.D. Anderson. 1979. Mixing characteristics of the North Saskatchewan River below Edmonton. Part I. Alberta Research Council, Edmonton, Alberta. 50 p.

Berner, M., N., Chymko, E. Liang, D. Lloyd and D. Stark. 1971. Effluent flow patterns in the North Saskatchewan River. Published jointly by the ICEQ - The University of Alberta, The Edmonton Anti-Pollution Group, and The Fish and Game Association of the Greater Edmonton Area, Edmonton, Alberta. 56 p.

Blachford, D.P., and E.D. Ongley. 1984. Biogeochemical pathways of phosphorus, heavy metals and organochlorine residues in the Bow and Oldman rivers, 1980-1981. Environment Canada, Inland Waters Directorate, Water Quality Branch, Ottawa. 36 p.

Bouthillier, P.H. 1983. A history of stream pollution assessment and control - North Saskatchewan River 1950's to 1980's. Prepared for Pollution Control Division, Alberta Environment. 58 p.

Bowser, W.E., A.A. Kjearsgaard, T.W. Peters, and R.E. Wells. 1962. Soil survey of Edmonton Sheet (83H). Alberta soil survey report 21. Canada Dept. of Agriculture, Research Council of Alberta, and University of Alberta. 66 p. + maps.

Brocke, L.K. 1977. Canada land inventory soil capability for agriculture in Alberta. Report to Alberta Environment by Pedology Consultants. 24 p.

Buikema Jr., A.L., M.J. McGinnis, and I. Cairns Jr. 1979. Phenolics in aquatic ecosystems: a selected review of recent literature. Marine Environment Research 2 (1979): 87-181.

Canadian Resourcecon Ltd., Reid Crowther and Partners Ltd., and Hydrogeological Consultants Ltd. 1982. Water Use in the North Saskatchewan River Basin. Report to Planning Division, Alberta Environment.

Ceroici, W. 1979. Hydrogeology of the southwest segment, Edmonton area, Alberta. Alberta Research Council report 78-5. 14 p. + maps.

City of Edmonton. 1982. Environmental Testing Program - Snow Disposal Operations, 1981-82. Materials and Testing, Engineering Department, City of Edmonton, Edmonton. 6 p.

City of Edmonton. 1983. Environmental Testing Program - Snow Disposal Operations, 1982-83. Materials and Testing, Engineering Department, City of Edmonton, Edmonton. 19 p.

Charlton, S.E.D., M. Hickman, and C.G. Jenkerson. 1981. Longitudinal physico-chemical and algal surveys of rivers flowing through the oil sands regions of North Eastern Alberta, Canada. Nova Hedwigia. 35: 465-522

Crosby, J. 1982. Prairie Provinces water board water demand study: environmental considerations in the Saskatchewan - Nelson Basin: Alberta. Alberta Environment Planning Division. 217 p. + attach.

Crowther, J., B. Wright, and W. Wright. 1978. Semi-automatic procedure for the determination of total nutrients. Water Quality Section, Ontario Ministry of the Environment. 59 p.

Davies, R.W., J. Culp, R.B. Green, M. O'Connell, G. Scott and C. Zimmermann. 1977. River classification study of the South Saskatchewan River basin. Report to Alberta Environment, Vols. I, II, III. 625 p.

Davis, J.C. 1975. Waterborne dissolved oxygen requirements and criteria with particular emphasis on the Canadian environment. National Research Council of Canada, NRC Committee on Scientific Criteria for Environmental Quality, Report No. 13, Pub. No. NRCC 14100 of the Environmental Secretariat. 111 p.

Department of National Health and Welfare. 1969. Canadian drinking water standards and objectives, 1968. Department of National Health and Welfare, Ottawa.

Department of National Health and Welfare. 1979. Guidelines for Canadian drinking water quality 1978. Minister of Supply and Services Canada, Ottawa. 76 p.

Department of National Health and Welfare. 1983. Guidelines for Canadian recreational water quality. Minister of Supply and Services Canada, Ottawa. 75 p.

Doyle, P.F. and J.H. Thompson. 1979. North Saskatchewan River - channel geometry, Berrymoor Ferry to Edmonton, and recent regime changes, Bighorn Dam to Edmonton. Alberta Research Council, Transp. and Surface Water Engineering Div. Report SWE 79/03. 49 p.

Dykstra, T. 1980. Prairie provinces water board water demand study: water-based recreation in the Saskatchewan-Nelson basin: Alberta. Alberta Environment Planning Division. 274 p.

Edmonton Metropolitan Regional Planning Commission. 1983. Agricultural Land. Prepared for Environment Council Alberta public hearings on agricultural land base in Alberta. 30 p. + appendices.

Edmonton Power. 1975. Biological study of the effects of the heated condenser water discharge from the Edmonton Power Cloverbar generating station in the North Saskatchewan River. Prepared for Edmonton Power Ltd. by Western Research and Development Ltd. 51 p.

Elliott, J.M. 1977. Some methods for the statistical analysis of samples of benthic invertebrates. Freshwater Biological Association. Scientific Publication No. 25, Windermere, England. 156 p.

Environment Canada. 1979. Guidelines for surface water quality. Vol. 1. Inorganic chemical substances. Water Quality Branch, Inland Waters Directorate, Environment Canada.

Environment Canada. 1981. Water quality data: Mackenzie River basin 1960-1979. Inland Waters Directorate, Water Quality Branch, Ottawa. 1080 p.

Environment Canada. 1982. Canadian climate normals, Vol. 5, Wind, 1951-1980. Atmospheric Environment Service, Canadian Climate Program. UDC: 551. 582.2(71).

Environment Canada. 1983. Surface water data. Alberta 1982. Water Survey of Canada, Water Resources Branch, Inland Waters Directorate. Pub. No. En36-403/1983.

Environment Canada. 1984a. Surface water data. Alberta 1983. Water Survey of Canada, Water Resources Branch, Inland Waters Directorate. Pub. No. En36-403/1983.

Environment Canada. 1984b. NAQUADAT dictionary of parameter codes. Inland Waters Directorate, Water Quality Branch, Ottawa. 318 p.

Environment Canada. 1985. Surface water data. Alberta 1984. Water Survey of Canada, Water Resources Branch, Inland Waters Directorate. Pub. No. En36-403/1984.

Environmental Protection Agency. 1976. Quality criteria for water. United States Environmental Protection Agency. EPA-440/9-76-023.

Environmental Studies Board. 1973. Water quality criteria 1972. U.S. Environmental Protection Agency, Committee of Water Quality Criteria, Washington, D.C. EPA-R3-73-033.

Geldreich, E.E. and B.A. Kenner. 1969. Concepts of fecal streptococci in stream pollution. J. Water Poll. Control Fed. 41(8): R 336-R 352.

Grabow, W.O.K., O.W. Prozesky and L.S. Smith. 1974. Drug resistant coliforms call for review of water quality standards. Water Research 8: 1-9.

Great Lakes Water Quality Board. 1976. Great Lakes Water Quality 1975. Appendix A - Annual Report of the Water Quality Objectives Sub-Committee Fourth Annual Report.

Gyles, C.L. 1984. Environmental aspects of _Escherichia_ _coli_ in human health. National Research Council Canada, publication 22490. 76 p.

Hamilton, H.R. 1983. Application of water quality criteria to the South Saskatchewan River basin planning program. Alberta Environment, Pollution Control Division, Water Quality Control Branch.

Helsel, D.R. 1983. Mine drainage and rock type influences on Eastern Ohio stream water quality. Water Resources Bulletin 19 (6): 881-887.

Hynes, H.B.N. 1972. The ecology of running waters. University of Toronto Press, 2nd edition. 555 p.

Hynes, H.B.N. 1969. The enrichment of streams, p. 188-196. _In_: Eutrophication: causes, consequences, correctives. National Academy of Sciences, Washington. 661 p.

Kathol, C.P. and R.A. McPherson. 1975. Urban geology of Edmonton. Alberta Research Council Bulletin 32. 61 p. + maps.

Kellerhals, R., C.R. Neill and D.I. Bray. 1972. Hydraulic and geomorphic characteristics of rivers in Alberta. Alberta Research Council, River Engineering and Surface Hydrology report 72-1. 52 p.

Kuntz, K.W. 1984. Toxic contaminants in the Niagara River, 1975-1982. Environment Canada, Inland Waters Directorate, Water Quality Branch, Ottawa. 47 p.

Lack, R.J. 1971. Quantitative studies on the phytoplankton of the rivers Thames and Kenner at Reading. Freshwat. Biol. 1: 213-224.

Longbottom, J.E., and J.J. Litchenberg (editors). 1982. Test methods: methods for organic chemical analysis of municipal and industrial wastewater. United States Environmental Protection Agency, Research and Development, Environmental Monitoring and Support Laboratory, Cincinnati, Ohio. EPA-600/4-82-057.

McKee, J.E. and H.W. Wolf. 1963. Water quality criteria. State Water Quality Control Board, Sacramento, Calif. Publication 3-A.

McNeely, R.N., V.P. Neimanis and L. Dwyer. 1979. Water quality source book. A guide to water quality parameters. Inland Waters Directorate, Water Quality Branch, Ottawa. 89 p.

Moss, B. 1967a. A spectrophotometric method for the estimation of percentage degradation of chlorophyls to pheo-pigments in extracts of algae. Limnol. Oceanogr. 12: 335-340.

Moss, B. 1967b. A note on the estimation of chlorophyll-a in freshwater algal communities. Limnol. Oceanogr. 12: 340-342.

Northcote, T.G. and D.A. Larkin. 1963. Western Canada. In: D.G. Frey (ed.). Limnology in North America. Univ. Wisconsin Press, Madison. pl 451-485.

Nwachukwu, B.A. and C.R. Neill. 1972. Analysis of channel regime, North Sask. River, Edmonton, to provincial boundary. Research Council of Alberta, D.O.E., U. of A., Dept. Highways and Transport. Studies in River Eng., Hydraulics and Hydrology Report REH/72-1. 33 p. + figs.

Odum, E.P. 1971. Fundamentals of ecology. 3rd ed. W.B. Saunders Company, Philadelphia. 574 p.

OECD. 1982. Eutrophication of waters, monitoring assessment and control. Organisation for economic co-operation and development. Renouf Publishing Company Ltd. 154 p.

Patterson, C.G. and J.R. Nursall. 1975. The effects of domestic and industrial effluents on a large turbulent river. Water Research. 9: 425-435.

Pospisilik, J. 1972. Dispersion of dyes and pollutants in North Saskatchewan River. M.Sc. Thesis, University of Alberta, Edmonton, Alberta. 97 p.

Renewable Resources Consulting Services Ltd. 1974. Environmental Considerations of Snow Dumping Practices in the City of Edmonton. 232 p.

Reynoldson, T.B., and S. Livingstone. 1983. Effects of spring runoff on the North Saskatchewan River in the City of Edmonton. Alberta Environment, Pollution Control Division, Water Quality Control Branch, Edmonton. 27 p.

Shiller, A.M., and E. Boyle. 1985. Dissolved zinc in rivers. Nature 317: 49-52.

Siegel, S. 1956. Nonparametric statistics for the behavioral sciences. McGraw-Hill, Toronto. 312 p.

Stainton, M.P., M.J. Capel, and F.A.J. Armstrong. 1977. The chemical analysis of freshwater, 2nd ed. Fish. Mar. Serv. Misc. Spec. Publ. 25. 180 p.

Stein, R. 1976. Hydrogeology of the Edmonton area (northeast segment) Alberta. Alberta Research Council report 76-1. 21 p. + maps.

Taylor, M.C., and A. Demayo. 1980. Guidelines for surface water quality, Vol. 1. Inorganic chemical substances: Zinc. Inland Waters Directorate, Water Quality Branch, Ottawa. 52 p.

Tett, P., C. Gallegos, M.G. Kelly. 1978. Relationships among substrate, flow, and benthic microalgal pigment density in the Mechums River, Virginia. Limnol. and Oceanogr. 23(4): 785-797.

Trew, D.O., D.J. Beliveau, and E.I. Yonge. 1985. The Baptiste Lake Study Technical Report. Water Quality Control Branch, Alberta Environment, Edmonton. 371 p.

Trew, D.O., E.I. Yonge and R.P. Kaminski. 1985. A trophic assessment of nine lakes in the Cold Lake region. Interim Report. Water Quality Control Branch, Alberta Environment, Edmonton. 70 p.

Water Quality Control Branch. 1984. Lac La Biche Brochure. Published by Water Quality Control Branch, Alberta Environment, Edmonton. 10 p.

Water Quality Control Branch. 1985a. Nakamun Lake Brochure. Published by Water Quality Control Branch, Alberta Environment, Edmonton. 10 p.

Water Quality Control Branch. 1985b. Lac La Nonne Brochure. Published by Water Quality Control Branch, Alberta Environment, Edmonton. 10 p.

Wetzel, R.G. 1975. Limnology. Saunders, Toronto. 743 p.

Wheater, D.W.F., D.D. Mara, and J. Oragui. 1979. Indicator systems to distinguish sewage from stormwater run-off and human from animal faecal material, Chapter 21. In: Biological indicators of water quality, A. James and L. Evison, eds., J. Wiley and Sons, Toronto.

Whitton, B.A. 1975. River ecology. Blackwell Scientific Publ., Oxford. 725 p.

Whitton, B.A. 1975. River ecology. Studies in Ecology Vol. 2. University of California Press, Los Angeles. 725 p.

Yaksich, S.M. and F.H. Verhoff. 1983. Sampling strategy for river pollutant transport. Journal of the Environmental Engineering Division, ASCE, Vol. 109. 1: 219-231.

Zar, J.H. 1974. Biostatistical Analysis. Prentice Hall, Inc., Englewood Cliffs, New Jersey. 620 p.

CA2ALEN 18
86N57
Pt 2 c.v.

North Saskatchewan River
Characterization of Water Quality in the Vicinity of Edmonton (1982-83)
Part II

LEGISLATURE LIBRARY
SEP 16 1986

Alberta
ENVIRONMENT
Environmental Protection Services
Pollution Control Division
Water Quality Control Branch

NORTH SASKATCHEWAN RIVER:
CHARACTERIZATION OF WATER QUALITY
IN THE VICINITY OF EDMONTON (1982-1983)

PART II

ZOOBENTHIC SURVEYS OF SPRING, SUMMER, AND FALL 1982

Prepared by:

A.-M. Anderson, Ph.D.

Water Quality Control Branch
Pollution Control Division
Environmental Protection Services
Alberta Environment
Edmonton, Alberta

January 1986

SUMMARY

A study of the water quality of the North Saskatchewan River as reflected by the zoobenthos or benthic invertebrates was initiated in the spring of 1982. Its primary objectives were the characterization of the river as it passes through the Edmonton area, and the identification of the degree of impact from urban development. Another objective was to evaluate complementary zoobenthic studies as integrators of water quality and as aids to the interpretation of chemical and physical data. Benthic invertebrate samples were collected in spring, summer, and fall 1982 at 11 sites from Devon to Pakan on both left and right banks.

The results of multivariate analyses (cluster and principal component analyses) and an evaluation of commonly used community parameters (total numbers, Shannon-Wiener diversity, distribution of numbers among taxa at each site, and distribution of numbers among sites for each major taxon) led to the identification of three major groups of sites. These groups represent zones of different water quality in the river.

Zone I was a group of sites which were located upstream of major point-source effluents. Benthic invertebrates were virtually unimpacted and the invertebrate assemblage was indicative of river water of high quality. The zoobenthos was characterized by relatively low total numbers and by high values for the Shannon-Wiener diversity. Taxa such as Ephemeroptera, Plecoptera, and Trichoptera, (known to be intolerant of high organic loads) were as important numerically as more tolerant taxa.

Zone II was an impacted group of sites located downstream of the major point-source discharges in the Edmonton area. Total benthic invertebrate numbers were much higher than in Zone I and tolerant taxa were numerically dominant. Diversity index values dropped.

Zone III was a group of sites showing some recovery and situated downstream of Zone II. Total invertebrate numbers remained much higher than in Zone I, but the zoobenthic assemblage of Zone I and Zone III had features in common as shown by similar diversity values and similar distributions of numbers among major taxonomic groups.

Municipal and industrial point-source discharges were responsible for the existence of zones of different water quality in the North Saskatchewan River from Devon to Pakan. The relative length of each zone at different times of the year was influenced by the flow rates and the water temperature regime.

Municipal discharges (wastewater treatment plant effluents, storm and combined sewer effluents) are the main contributors to the nutrient and total organic loads of the North Saskatchewan River. Certain invertebrate taxa responded to these point-source discharges by increasing in numbers. The magnitude and consistency of this type of response was greatest below the Gold Bar Wastewater Treatment Plant. The impact from storm and combined sewer effluents was most evident during summer and fall. During periods of heavy runoff, combined sewers known to discharge a mixture of sewage and surface runoff into the North Saskatchewan River induced a much sharper increase in invertebrate density than did storm sewers which discharged mainly surface runoff into the river.

Specific impacts of industrial discharges were masked by the enrichment effects of the Gold Bar Wastewater Treatment Plant. There were no consistent indications of an overall toxic effect in the study area delimited by the Devon and Pakan bridges. Enrichment, particularly below Fort Saskatchewan, had a greater impact on benthic invertebrates. However, the purpose of this study was to assess the integrated impact of all effluents on the water quality of a given section of the North Saskatchewan River, not to measure the impact of industrial point-source effluents.

Seasonal differences in water temperatures and flow rates explained the differences in the relative lengths of Zone II and Zone III in spring and fall. Biological and chemical breakdown processes take place more rapidly at higher temperatures, provided that dissolved oxygen levels are adequate. The North Saskatchewan River had satisfactory dissolved oxygen levels throughout the year in 1982, which permitted benthic invertebrates to recover faster below point-source effluents in the fall than in the spring. The faster recovery in the fall of 1982 was undoubtedly related to the scouring or cleansing process which accompanied the unusually high discharge in the spring of that year. Invertebrate data suggested the existence of a cyclic and dynamic pattern whereby the river bed is cleaned by scouring if spring peak discharges are adequate, and gradually enriched and fouled in downstream direction during summer and fall by discharges from the Edmonton urban area.

TABLE OF CONTENTS

Page

SUMMARY i
TABLE OF CONTENTS iv
LIST OF TABLES v
LIST OF FIGURES vi
ACKNOWLEDGMENTS vii

1.0 INTRODUCTION 1

2.0 METHODS 4
2.1 The Study Area and Study Design 4
2.2 Field Methods and Site Selection 11
2.3 Laboratory Methods 12
2.4 Data Analysis 12
2.4.1 Cluster Analysis and Principal Component Analysis . 14
2.4.2 One-way Analysis of Variance 16

3.0 RESULTS 18
3.1 General Description of the Invertebrate Community 18
3.2 Community Descriptors 25
3.2.1 Total Numbers 26
3.2.2 Number of Individuals per Major Taxon 36
3.2.3 Shannon-Wiener Diversity 37
3.3 Multivariate Analysis 40
3.3.1 Cluster Analysis 40
3.3.2 Principal Component Analysis 44
3.3.3 Major Characteristics of Taxa which Emerge from Principal Component Analysis 44
3.3.4 Relationship between Results Obtained by Cluster Analysis and Principal Component Analysis 56
3.3.4.1 Spring 56
3.3.4.2 Summer 57
3.3.4.3 Fall 57
3.3.5 One-way Analysis of Variance (ANOVA) 59
3.3.5.1 Spring 59
3.3.5.2 Summer 61
3.3.5.3 Fall 61

4.0 DISCUSSION 64
4.1 Community Descriptors 64
4.2 Multivariate Analyses 75
4.3 Indications of a Seasonal Pattern in the Water Quality of the North Saskatchewan River 80

5.0 CONCLUSIONS 82

6.0 LITERATURE CITED 85

APPENDIX 90

LIST OF TABLES

Page

1a. Major industrial effluents entering the North Saskatchewan River 7

1b. Municipal sewage effluents entering the North Saskatchewan River 8

1c. Description of sampling sites in the North Saskatchewan River 9

2. List of invertebrate taxa found in samples from the Spring, Summer and Fall survey 19

3. Spring 1982: mean and standard error of major zoobenthic variables 33

4. Summer 1982: Mean and standard error of major zoobenthic variables 34

5. Fall 1982: Mean and standard error of major zoobenthic variables 35

6. Eigenvalues and percentage variance explained by each Eigenvector for Spring, Summer, and Fall data 45

7. List of taxa which have high positive or negative scores for the first three vectors 46

8. Comparison of means for selected benthic variables between site groups defined by CA and PCA in Spring 60

9. Comparison of means for selected benthic variables between site groups defined by CA and PCA in Fall 62

LIST OF FIGURES

Page

1. Map of Study Area 5

2. Spring Right Bank: Total Invertebrate Density and Density of Major Taxa 27

3. Spring Left Bank: Total Invertebrate Density and Density of Major Taxa 28

4. Summer Right Bank: Total Invertebrate Density and Density of Major Taxa 29

5. Summer Left Bank: Total Invertebrate Density and Density of Major Taxa 30

6. Fall Right Bank: Total Invertebrate Density and Density of Major Taxa 31

7. Fall Left Bank: Total Invertebrate Density and Density of Major Taxa 32

8. Shannon-Wiener Diversity 38

9. Multivariate Analysis of Zoobenthic Data from Spring 1982. 41

10. Multivariate Analysis of Zoobenthic Data from Summer 1982. 42

11. Multivariate Analysis of Zoobenthic Data from Fall 1982 .. 43

12. Taxa Showing Characteristic Density Changes in the North Saskatchewan River in the Vicinity of Edmonton 48

13. Spring 1982: Schematic Presentation of Zones of Different Water Quality in the North Saskatchewan River .. 76

14. Fall 1982: Schematic Presentation of Zones of Different Water Quality in the North Saskatchewan River .. 77

ACKNOWLEDGMENTS

The author wishes to acknowledge the help of several individuals in completing Part Two of this report.

Bernard Wright provided field and laboratory assistance; Grant Bodie, David Dowhaniuk, Scott Livingstone, and Martin Soetaert assisted in the field; Marianne Lines provided laboratory assistance; Marianne Klemka and Teresa Richey assisted with proofing. Figures for Part Two of this report were prepared by Terry Zenith and staff, Design and Construction Division. Hal Hamilton provided valuable comments on a first draft. Stewart Anderson critically reviewed and edited the manuscript. I especially thank Lilliane Godin and Gloria de Castro for typing the manuscript.

1.0 INTRODUCTION

This report summarizes the results of a zoobenthic survey which was conducted during the spring, summer, and fall of 1982 in the North Saskatchewan River at eleven locations between and including the Devon and Pakan bridges. This survey comprised Part Two of a broader water quality survey conducted by the Water Quality Control Branch, Alberta Environment, on the North Saskatchewan River in 1982 and 1983. The results of the water chemistry, chlorophyll, and bacteriological studies are presented in Part One.

The principal objectives of the zoobenthic survey were:

1. to provide a spatial and temporal characterization of the North Saskatchewan River zoobenthic community as it reflects river water quality in the vicinity of Edmonton City by assessing bank-to-bank, upstream-downstream, and seasonal differences.
2. to assess the impact of urban development in the Edmonton region on the zoobenthic community of the North Saskatchewan River.
3. to evaluate the zoobenthic survey as a complementary study to the water chemistry survey.

Part Two was undertaken with the expectation that zoobenthic data and physical-chemical data provide converging lines of evidence on water quality and, therefore, that they should complement rather than replace each other. The value of such a complementary approach has been discussed extensively in the literature (e.g. Hynes 1970, Cairns and Dickson 1973). Surveys of chemical and physical variables provide a means of detecting and quantifying a wide range of pollutants in rivers; they also permit the determination of point-sources for these pollutants and provide the basis for enforceable standards. However, water chemistry surveys describe conditions at the time of sampling and, depending on flow regimes, mixing patterns, and type of effluent discharge, the data and their interpretation may not be representative of the nature and extent of pollution. Pollutants which are present at low concentrations or which occur sporadically may remain undetected by standard analytical techniques; such pollutants can have significant impacts on river biological communities, because they are exposed to these substances over an extensive period of time.

Because quality of the water is only fully manifested in relation to living organisms, it is important to monitor the effects of water quality changes on biological communities. Of the total aquatic fauna present in a river, the zoobenthos offers the greatest potential in terms of biomonitoring. Because of the low mobility of most species, the zoobenthos has less ability to escape adverse water quality conditions than fish or plankton. Although zoobenthic taxa may respond to the deterioration of their habitat by drifting, most species are restricted to a given river section by their low mobility potential. Here, they remain exposed to changes in water quality over time and they respond according to their tolerance levels.

The zoobenthic community integrates variations in water quality over an extensive time period prior to sampling and, consequently, can be used successfully to aid in the assessment of water quality. However, the complexity and diversity of interactions of components of biological communities with each other and with their abiotic environment make it difficult to find a fully satisfactory descriptor of water quality in terms of biological parameters*. To date it has not been feasible to set water quality standards in terms of absolute quantitative biological data. Therefore, one of the objectives of Part One of this study (i.e. a comparison of current river water quality with the Alberta Surface Water Quality Objectives**) is not applicable to Part Two, the zoobenthic survey.

---

* "parameter" in the sense of Sutcliffe (1979).

** Alberta Environment 1977.

2.0 METHODS

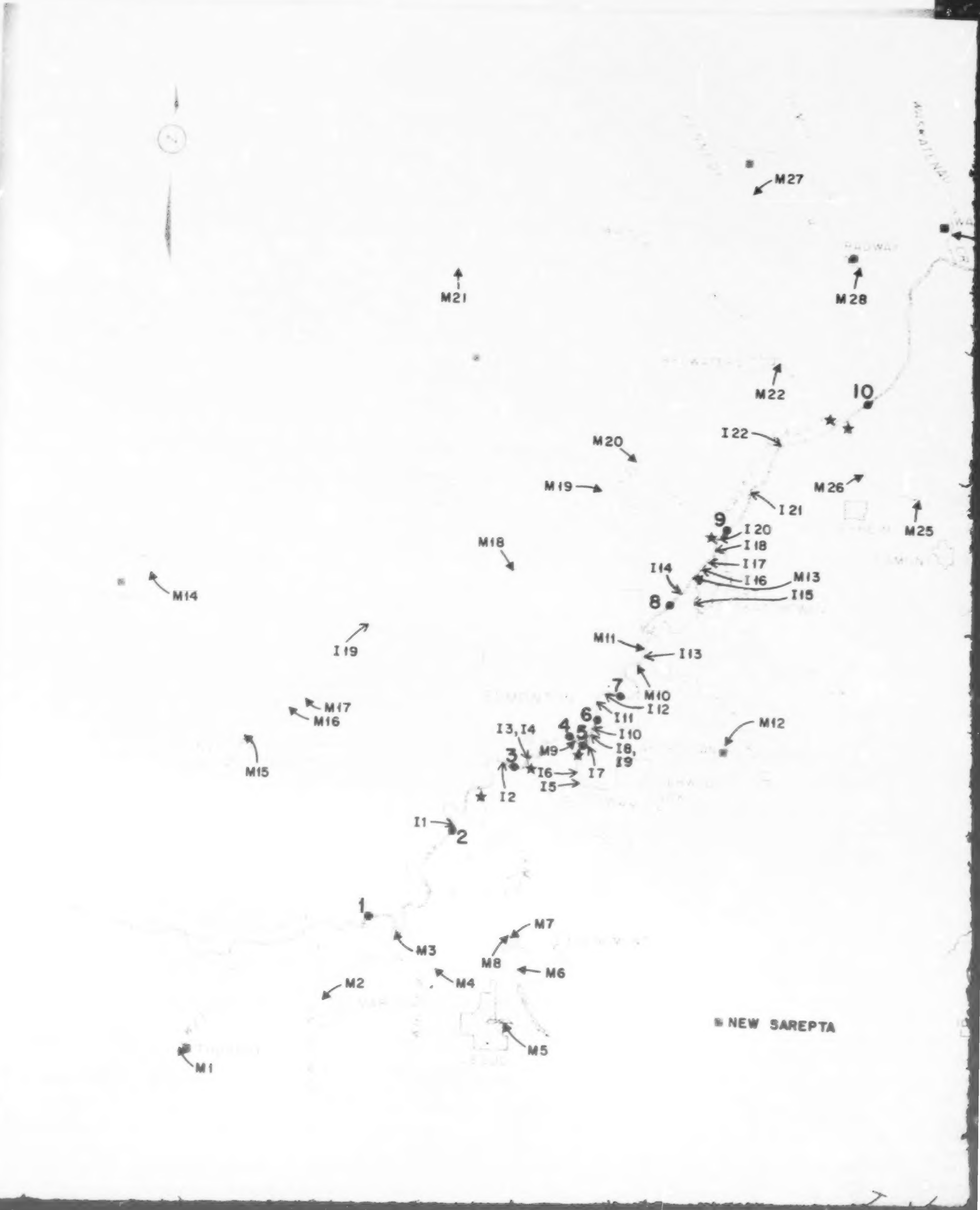
2.1 The Study Area and Study Design

The zoobenthic survey was conducted in the section of the North Saskatchewan River extending from a location near the Highway 60 bridge at Devon to a location downstream of Pakan Bridge at the old river ferry crossing near Victoria Settlement (Fig. 1). The major industrial effluents entering this section of the river are listed in Table 1a; the municipal sewage effluents are listed in Table 1b. Major effluent locations are shown in Figure 1. The main historic, geologic, geographic, and other river basin characteristics and the mixing processes in the study section of the river are described in Part One of this report.

The zoobenthos was sampled three times in the North Saskatchewan River during the open-water season of 1982:

Spring	May 17 to June 3
Summer	August 9 to August 17
Fall	September 23 to October 10

Because of the integrator quality of the zoobenthos and because of the relative longevity of most zoobenthic taxa (several months to two or more years), it was neither necessary nor practical to sample zoobenthos with the same frequency that water samples were taken for chemical analysis.


M27
RADWAY
M21
M28
M22
10
I22
M20
M19
M26
I21
M25
9
I20
M18
I18
I17
I14
M13
I16
M14
I15
8
M11
I13
I19
M10
7
I12
M17
M16
6
I11
M12
I3, I4
4
5
I10
3
M9
I8,
I9
M15
I6
I7
I5
I2
I1
2
1
M7
M3
M8
M6
M2
M4
NEW SAREPTA
M5
M1

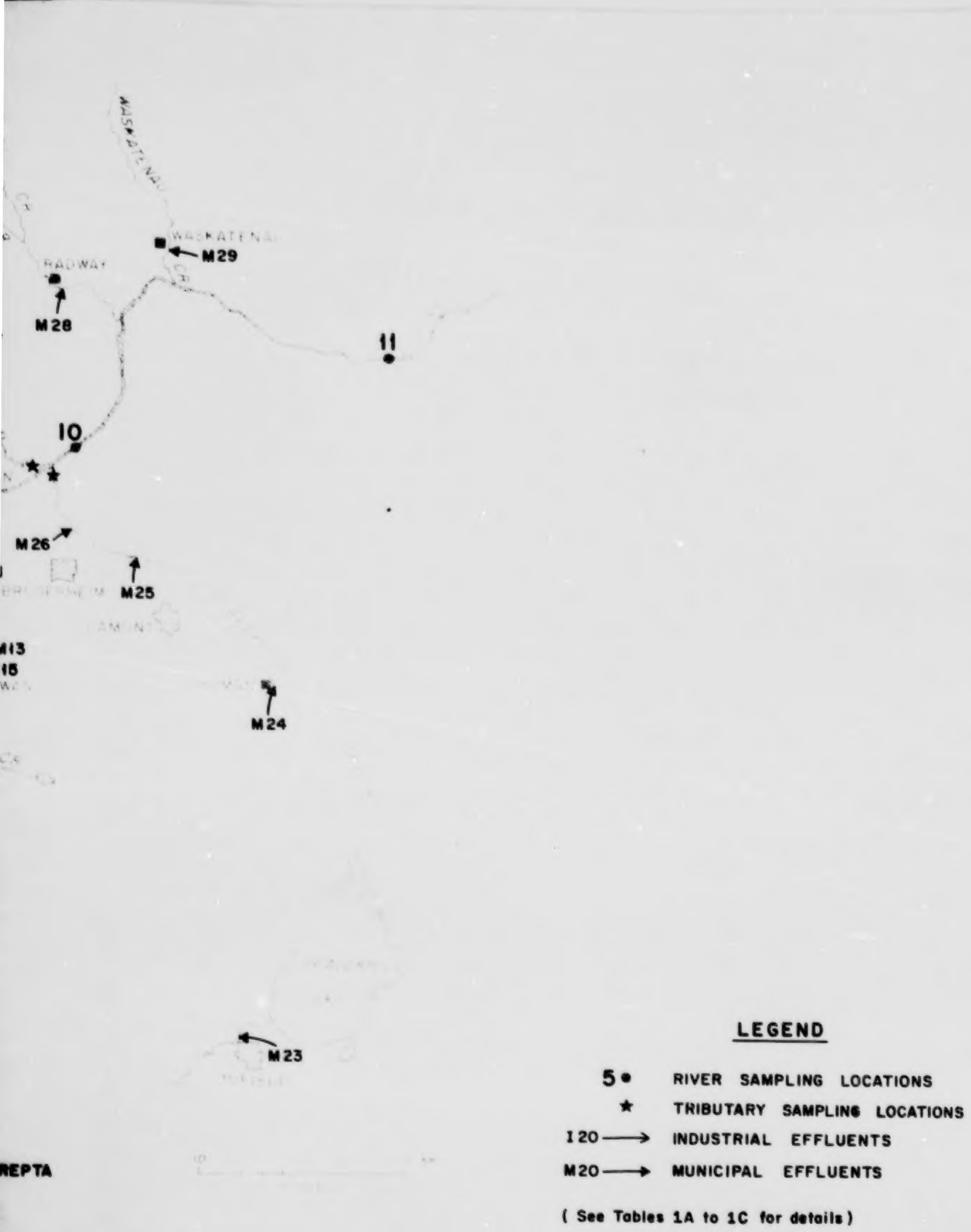

WASKATENAU CR.
WASKATENAU
M29
RADWAY
M28
11
10
M26
BRUDERHEIM
M25
LAMONT
M13
15
M24
M23
REPTA
LEGEND
5● RIVER SAMPLING LOCATIONS
★ TRIBUTARY SAMPLING LOCATIONS
I20⟶ INDUSTRIAL EFFLUENTS
M20⟶ MUNICIPAL EFFLUENTS
(See Tables 1A to 1C for details)

Fig. 1. North Saskatchewan River study area.

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

TABLE 1a. Major Industrial Effluents Entering the North Saskatchewan River in the Vicinity of Edmonton City, 1982.

I1. E. L. SMITH WATER TREATMENT PLANT

I2. UNIVERSITY OF ALBERTA (THERMAL)

I3. ROSSDALE POWER PLANT

I4. ROSSDALE WATER TREATMENT PLANT

I5. STELCO

I6. C.I.L.

I7. IMPERIAL OIL REFINERY

I8. SYNCRUDE RESEARCH

I9. TEXACO REFINERY

I10. GULF REFINERY

I11. CELANESE CANADA, UNIROYAL, FIBERGLASS

I12. CLOVERBAR POWER PLANT

I13. ALBERTA CONCRETE, NESBIT

I14. ALBERTA FOOD PRODUCTS

I15. MANVILLE CANADA INC.

I16. SHERRITT GORDON

I17. UNION CARBIDE

I18. DOW CHEMICAL

I19. ALBERTA CONCRETE, VILLENEUVE

I20. DIAMOND SHAMROCK

I21. SHELL REFINERY, SCOTFORD

I22. ESSO CHEMICALS, REDWATER

TABLE 1b. Municipal Sewage Effluents* Entering the North Saskatchewan River directly or indirectly in the Vicinity of Edmonton City, 1982.

M1.	THORSBY
M2.	CALMAR
M3.	DEVON SEWAGE TREATMENT PLANT
M4.	INTERNATIONAL AIRPORT
M5.	LEDUC
M6.	NEW SAREPTA
M7.	BEAUMONT
M8.	NISKU
M9.	GOLD BAR WASTEWATER TREATMENT PLANT (GBWTP), EDMONTON
M10.	BREMNER SEWAGE LAGOONS
M11.	ST. ALBERT SEWAGE LAGOONS
M12.	ARDROSSAN
M13.	FORT SASKATCHEWAN
M14.	ONOWAY
M15.	STONY PLAIN
M16.	PARKLAND VILLAGE
M17.	SPRUCE GROVE
M18.	MORINVILLE
M19.	BON ACCORD
M20.	GIBBONS
M21.	LEGAL
M22.	REDWATER
M23.	TOFIELD
M24.	CHIPMAN
M25.	LAMONT
M26.	BRUDERHEIM
M27.	THORHILD
M28.	RADWAY
M29.	WASKATENAU

---

* Since this study was completed, the Edmonton Regional Wastewater Treatment Plant has become operative, combining some of the above treatment facilities. These changes are described in greater detail Part One of this report.

TABLE 1c. Regular Zoobenthos Sampling Locations, North Saskatchewan River, 1982.

Location Number	Location Name	Relative River Kilometres	Location Description	Selection Criteria
1.	DEVON	0	Near Devon Bridge, Highway 60	Control location (background conditions.
2.	E. L. SMITH	24	Immediately upstream E.L. Smith water treatment plant	To determine impacts from Devon municipal effluent on water supply
3.	ROSSDALE	40	100 m downstream of 105th St. Bridge-Rossdale	To determine impacts from large separate storm sewers on water quality for Rossdale Water Treatment Plant
4.	50TH STREET FOOTBRIDGE	51	100 m upstream of 50th St. Footbridge	To identify impacts from large combined storm sewers before Gold Bar Wastewater Treatment Plant
5.	RUNDLE FOOTBRIDGE	52	100 m downstream of Rundle Park Footbridge	To identify impacts from Gold Bar Wastewater Treatment Plant prior to industrial discharges
6.	BEVERLY BRIDGE	55	200 m downstream Beverly Railway Bridge	To incorporate effects of industrial - part refinery discharges
7.	CLOVER BAR	61	4 km downstream of Celanese; downstream of Clover Bar	To incorporates all municipal and industrial effluents from Edmonton
8.	FORT SASKATCHEWAN	79	200 m upstream Fort Saskatchewan Railway Bridge	Downstream of St. Albert and Bremner lagoons
9.	STURGEON	89	Downstream of confluence with Sturgeon River	To include effects of Fort Saskatchewan industrial and municipal effluents
10.	VINCA	112	500 m downstream of Vinca Bridge	To reflect all major inputs; also robot monitor location
11.	PAKAN	163	10 km downstream of Pakan Bridge	Location reflecting complete mixing in the river; also near a routine monitoring site

The eleven regular sampling locations for 1982 are listed in Table 1c and are shown in Figure 1. Zoobenthos sampling sites were virtually the same as left-bank and right-bank water chemistry sampling sites in 1982.

The farthest upstream and downstream locations were chosen to represent relatively unimpacted (control) sites, and sites within the recovery zone, respectively. The other nine locations were selected on the basis of their representativeness and value in identifying potential impacts from certain known discharges. At each sampling location, two sampling sites were established, one near the right-bank and one near the left-bank.

Although there are dams, agricultural and oilfield developments, and some population centres (Rocky Mountain House and several smaller centres) upstream of Devon, the NSR at the Devon bridge is considered relatively unimpacted by domestic and industrial waste effluents (unpublished data, Alberta Environment). The first sampling location is upstream of the Devon Sewage Treatment Plant, at the site of an Alberta Environment River Water Quality Monitoring Network monitor.

The mixing studies reviewed in Section 3.0, Part One of this report indicated incomplete mixing as far downstream as Vinca bridge on Highway 38. However, it is assumed that mixing is complete most or all of the year at Pakan Bridge, another routine station of the River Water Quality Monitoring Network. The site was therefore chosen as the lower sampling location.

2.2 Field Methods and Site Selection

Under natural conditions (i.e. absence of pollution) in any section of a river, localized differences in faunal composition are mainly due to variations in habitat characteristics. Current velocity and substrate type are often the most important in this regard (Hynes 1972). All sites selected for benthic invertebrate sampling were riffles in order to provide a high similarity in substrate type among sites. An attempt was made to fix precise sampling location so that successive sampling was done in the same type of substrate. The substrate of all sites except the Sturgeon left-bank site, which was boulder and cobble, was medium to coarse pebble mixed with sand and silt (terminology according to Cummins, 1962). There was less silt at most upstream sites, such as Devon, than at sites downstream of Edmonton, but there was more sand at upstream sites than at downstream sites. The variation in amount of silt from site-to-site was greater during the spring sampling than during the fall sampling; during the summer all sites had a similar amount of silt.

At least 3 measurements of current velocity were made at each site using a Gurley current meter.

At each site, 5 Neill cylinder samples (Neill 1938), representing a sampling area of 0.1 m^2, were collected and filtered through a collecting net with mesh aperture of 210 μm. Care was taken to press the cylinder securely into the substrate to prevent the loss of specimens through gaps between the sampler and the substrate.

Larger stones were individually cleaned by gentle scrubbing and rinsing in the cylinder. A narrow shovel was used to disturb the substrate for approximately one minute. Samples were preserved in 4% formaldehyde immediately after collection.

2.3 Laboratory Methods

Samples collected in the field were stained with Rose Bengal before being sorted and enumerated in the laboratory under a dissecting microscope. Mason and Yevich (1967) have shown that the efficiency with which zoobenthic specimens are separated from the detritus fraction is greater in samples which have been stained, because animals are more easily distinguished from algae and detritus. Sorting under a dissecting microscope may be more time consuming than sorting in the field, but it is a more accurate method for the processing of river benthos.

Invertebrates were identified according to Bauman _et_ _al_. (1977), Clarke (1973), Edmunds _et_ _al_. (1976), Merritt and Cummins (1979), Pennak (1953), Usinger (1956), and Wiggins (1977).

2.4 Data Analysis

The Shannon-Wiener Diversity Index is one of the most widely used mathematical expressions of abundance and diversity in biological systems, although many other expressions have also been proposed to summarize extensive data sets in concise and meaningful terms (e.g.

Shannon and Weaver 1949, Simpson 1949, King and Ball 1964, Cairns *et al*. 1968, Chutter 1972, Hilsenhoff 1977, Armitage *et al*. 1983). One of the major purposes of these expressions is to relate their calculated values to environmental conditions, such as levels of pollution, as a means of appraising the degree or extent of environmental impact (Hellawell 1977, Godfrey 1978, Perkins 1983). In this report, the Shannon-Wiener diversity index (H') was used and calculated according to the following formula:

$$H' = - \sum_{i=1}^{n} p_i \ln p_i$$

where $p_i = n_i/N$
n_i = numbers in taxon i
N = total numbers
n = number to taxa

The Shannon-Wiener diversity index or H' is a quantitative measure of diversity which takes numbers per taxon into account, but is not affected by the actual species composition or assigned tolerance levels for individual species as are most "biotic indices" (e.g. Hilsenhoff 1977, Rooke and Mackie 1982, Armitage *et al*. 1983). The usefulness of H' in assessing the impact of pollution is based on the assumption that pollution-related factors affect total community structure. Unaffected communities are, in general, characterized by an even distribution of numbers per species (i.e. many species with few individuals per species), whereas affected communities tend to have skewed distributions (i.e. high densities for a few species; low numbers for the remaining species). Generally, H' has the highest values in unpolluted habitats, and decreases as the degree of pollution increases (Cairns _et_ _al_. 1972, Hughes 1975). In unpolluted waters, the index ranges from 3.0 to 4.0; in stressed communities, it may drop below 1.5 (Wilhm 1970).

Cook (1976) has suggested that H' is sensitive to impacts along the entire pollution spectrum from unpolluted to heavily polluted. Although H' has been used successfully as an indicator of pollution impact in numerous studies, one should be cautious in the interpretation of diversity values (Godfrey 1978, Hughes 1978, Murphy 1978, Cook 1976). For example, many studies have shown that H' is inversely correlated with pollution, but there are exceptions to this relationship (Harrel and Doris 1968). Trends in H' values along a gradient might be meaningful, but it would be spurious to elaborate on slight differences in H' values which could be due to chance (Cook 1976). Hughes (1975) has shown that factors such as sampling method, area sampled, time of year, and taxonomic level of identification all influence the value of H'. Therefore, comparisons between diversity values are not legitimate when sampling and processing techniques are inconsistent or when samples are compared for different seasons.

2.4.1 Cluster Analysis and Principal Component Analysis

Two multivariate techniques, cluster analysis and principal component analysis, were used in the analysis of zoobenthic data. Both analyses provide a means of comparing samples using all numerical abundance data for each taxon. Some theoretical considerations and practical applications of these two techniques have been discussed by Gauch and Whittaker (1972), Sinhai (1977), Sprules (1977) and Green (1979). Cluster analysis and principal component analysis were performed with the aid of the CLUSTAN-Package (Wishart 1978).

Cluster analysis is a technique whereby the data are analyzed by site and are grouped according to similarities among the zoobenthic species (i.e., qualitatively and quantitatively). The similarity index used in the present analysis was the squared euclidean distance. A variety of techniques can be applied to the resulting similarity matrix for the fusion of similar clusters. The Ward (1963) method was used here. Results were obtained graphically in the form of a dendrogram. Site data sets with similar zoobenthic associations clustered together; the differences in similarity coefficients between clusters at their fusion points was used as a relative measure of the degree of similarity (or dissimilarity) between clusters.

The description by Green (1979, p. 82) shows how principal component analysis converts the "m samples by p variables" data set to a "p-by-p" covariance or correlation matrix. The roots and vectors (called eigenvalues and eigenvectors) of this p-by-p matrix are then found; they correspond respectively to the variance associated with each principal component and to the principal component coefficients b_{i1} in the following function:

$$Y_i = b_{i1} X_1 + b_{i2} X_{2+} \ldots + b_{ip} X_p.$$

Principal component analysis transforms observations on a set of p variables $X_{j=1,p}$ to observations on a new set of quantitative variables $Y_{j=1,p}$ where the new set has the following properties (see Marriott 1974, cited by Green 1979, p. 81):

1. Each new variable Y_i is a linear additive function of the old variables:

   $Y_i = b_{i1} X_1 + b_{i2} X_2 + \ldots + b_{ip} X_p$

2. The first new variable extracted (Y_1) is the first principal component and accounts for the largest possible amount of variation in the data set.

3. Each additional new variable accounts for the largest possible amount of remaining variation, independent of the previously derived principal components. Therefore, the new variables Y_i will be uncorrelated, unlike the original variables X_j. They will also tend to be more normally distributed.

2.4.2 One-Way Analysis of Variance

A one-way analysis of variance (ANOVA) was used to compare the means for selected benthic parameters from site groups (clusters) which were identified by multivariate analysis. The test was performed on the following parameters: numbers of Nematoda, Oligochaeta, Ephemeroptera, Plecoptera, Trichoptera, Chironomidae; total invertebrate numbers; total number of invertebrate taxa; Shannon-Wiener diversity.

For each parameter, the data set was tested for normality with the Kolmogorov-Smirnov test (Seigel 1956; Hull and Nie 1981). If a normal distribution was rejected ($p>0.05$), data were transformed to ln(x+1) (Elliott 1977). The Kolmogorov-Smirnov test on the transformed data showed that the normality was increased satisfactorily in all cases. Normally distributed data were analyzed with a one-way ANOVA to determine the significance of differences between sites for each parameter (Sokal and Rohlf 1969, Elliott 1977, Nie *et al*. 1975). If such differences were significant, a Student-Newman-Keuls test (Sokal and Rohlf 1969, Nie *et al*. 1975) was performed to determine whether the means for site groups were significantly different.

3.0 RESULTS

3.1 General Description of the Invertebrate Community

The benthic invertebrate taxa which were collected in the North Saskatchewan River in this study are listed in Table 2. A total of 107 zoobenthic taxa was recorded for the overall study, with 77, 75 and 94 taxa for the spring, summer, and fall samplings, respectively. Table 2 also gives a general indication of the abundance of the various taxa in the three sample sets. The raw benthic invertebrate data sets for the spring, summer, and fall surveys are included in Part Three. For the convenience of readers who may not be familiar with both the scientific and common names for some of the taxonomic groups discussed in this report, a summary is given in Appendix I.

The major taxonomic groups identified in the benthos of the North Saskatchewan River were Chironomidae (particularly Chironomini and Orthocladiinae), Oligochaeta (mostly Naididae and Tubificidae), Nematoda, Ephemeroptera, Trichoptera, and Plecoptera. Except for the mollusk _Ferrissia_, which was fairly abundant during summer and fall, the remaining taxa (i.e., Turbellaria, Hirudinea, Collembola, Odanata, Lepidoptera, Arachnida, miscellaneous Diptera, and miscellaneous mollusks) were generally of minor numerical importance.

Ephemerella and _Baetis_ were the dominant mayflies in spring samples, but _Tricorythodes_ and _Heptagenia_ were more important in summer and fall.

TABLE 2 List of Invertebrate Taxa found in samples from the Spring, Summer and Fall Survey.

	SPRING	SUMMER	FALL
Coelenterata	x	x	x
Nematoda			
Mermithoidea	xx	xx	xx
Unid. Nematoda	xx	xx	xx
Turbellaria	x	x	x
Acanthocephala			
Neoechynorhynchus	x	–	–
Cestoda			
Caryophillidae	x	–	–
Oligochaeta			
Tubificidae	xx	xx	xx
Naididae	xx	xx	xxx
Enchytraeidae	x	x	x
Lumbricidae	x	–	–
Hirudinea			
- *Eropbdella punctata*	x	x	x
- *Glossiphonia complanata*	x	–	x
- *Helobdella stagnalis*	–	x	–
- *Nephelopsis obsura*	x	–	–
Amphipoda			
- *Gammarus lacustris*	x	–	x
- *Hyalella azteca*	x	x	x
Copepoda			
- Cyclopoida	x	x	xx
- Calanoida	x	x	x
- Harpacticoida	x	x	x
Cladocera			
- *Ilyocryptus sordidus*	–	–	x
- Misc. (e.g. *Daphnia* sp., *Bosmina* sp, *Ceriodaphnia* sp., *Acroperus harpae*, *Pleuroxus procurvus*)	x	x	x
Ostracoda			
Rotifera Misc. (*Lecane monostyla*, *Asplanchna* sp., *Brachionus* spp.)	x	x	x
Ephemeroptera			
Ameletus	–	–	x
Baetis	xx	x	xx
Caenis	x	x	x
Centroptilum	–	x	x
Ephemera	x	x	x
Ephemeridae	–	x	–
Ephemerella	xx	x	x

TABLE 2 List of Invertebrate Taxa found in samples from the Spring, Summer and Fall Survey Cont'd.

	SPRING	SUMMER	FALL
Heptagenia	x	xx	xx
Heptageniidae	x	x	xx
Hexagenia	x	-	x
Lepthophlebia	-	-	x
Paraleptophlebia	-	x	x
Parameletus	-	-	x
Pseudocleon	-	x	x
Rhithrogena	x	x	x
Stenonema	-	x	x
Tricorythodes	x	xx	xx
Unid. Nymphules	x	xx	xx
Trichoptera			
Arctopsyche	x	x	x
Brachycentrus	x	x	x
Ceraclea	x	x	x
Cheumatopsyche	xx	xx	xx
Glososoma	x	x	x
Hydropsyche	xx	xx	xx
Hydropsychidae	x	xx	xx
Hydroptila	x	x	
Lepidostoma	x		
Leptoceridae	x	x	x
Mayatrichia	-	x	x
Neotrichia	-	x	x
Neureclipsis	x	-	x
Oecetis	x	x	x
Onocosmoecus	x	-	-
Polycentropus	-	-	x
Psychomyia	x	x	xx
Plecoptera			
Acroneuria	x	x	
Alloperla	x	x	x
Capniidae	-	-	x
Chloroperlidae	xx	x	xx
Isogenus	x	x	x
Isoperla	x	x	x
Perlidae	x	x	
Perlodidae	xx	x	xx
Pteronorcys	x	-	-
Taeniopteryx	x	-	x
Unid. Plecoptera	xx	x	xx
Collembola	x	x	x

TABLE 2 List of Invertebrate Taxa found in samples from the Spring, Summer and Fall Survey Cont'd.

	SPRING	SUMMER	FALL
Odonata			
- *Aeshna*	-	-	x
- *Gomphus*	x	-	-
- *Ophiogomphus*	x	x	x
Lepidoptera (Noctuidae?)	x	-	-
Corixidae			
Callicorixa audeni	x	x	xxx
Sigara spp (e.g. *S*. *lineata*, *S*. *bilineata*)	-	x	x
Hesperocorixa laevigata	-	-	x
H. *atopodonta*	-	-	x
Notonectidae			
Notonecta undulata	-	-	x
Coleoptera			
Elmidae	x	x	x
Dytiscidae	-	x	x
Chrysomelidae	x	-	-
Haliplidae	-	x	-
Diptera			
Chironomidae			
- Chironomini	xx	xx	xx
- Tanytarsini	x	x	x
- Orthocladiinae	xxx	xxx	xxx
- Tanypodiinae	x	x	x
- pupae	x	x	x
Ceratopogonidae	x	x	x
Tipulidae			
- *Erioptera*	-	-	x
- *Hexatoma*	x	x	x
- *Anotocha*	-	x	x
- *Limnophila*	-	x	x
- *Dicranota*	-	x	-
Ephydridae	-	-	x
Chaoboridae			
- *Chaoborus*	-	x	x
Tabanidae			
- *Tabanus*	x	-	x
Rhagionidae			
- *Atherix*	-	-	x
Empididae	x	x	x
Dolichopodidae	x	x	x

TABLE 2 List of Invertebrate Taxa found in samples from the Spring, Summer and Fall Survey Cont'd.

	SPRING	SUMMER	FALL
Simuliidae			
- *Simulium arcticum*	x	x	x
Tanyderidae	x	-	-
Misc. Adult Diptera	-	x	x
Aranea			
Acari	x	x	x
Aranea	x	x	x
Mollusca			
Physidae	x	x	x
Lymnaeidae	x	x	x
Planorbidae	x	-	x
Sphaeriidae			
- *Pisidium*	x	x	x
- *Sphaerium*	x	x	x
Ancylidae			
- *Ferrissia*	x	xx	xx

-	absent (from all sites and samples)
x	sporadic occurrence (occasionally found in certain sites, numbers are usually low)
xx	common (found in most sites, relatively abundant)
xxx	very common (found in virtually all sites and often very abundant)

Caddisflies of the family Hydropsychidae, especially Hydropsyche and Cheumatopsyche, represented the major fraction of the total zoobenthos biomass at Vinca Bridge and Pakan Bridge. Psychomyia and Glossosoma, also common caddisflies in the North Saskatchewan River, were usually less abundant than the two genera noted above.

Perlodidae and Chloroperlidae were the most commonly occurring stonefly families. Most Plecoptera nymphs designated as "unidentified" were members of one of these two families.

A number of taxa, which are not true components of the river benthos, which were present in the samples apparently incidentally rather than as a result of water quality, or which are uncommonly recorded in benthic surveys, occurred in the North Saskatchewan River samples. Abundance data for these taxa have not been included with the raw data in Part Three of this report. The occurrence of these taxa in the samples is discussed here briefly.

In the fall, very high numbers of Corixidae (i.e., estimated as high as 10,000 specimens per sample and consisting mostly of Callicorixa audeni, Sigara lineata and S. bilineata) were present in right-bank samples from E. L. Smith. Somewhat lower numbers were present in left-bank samples from E. L. Smith as well as in samples from both banks at Pakan Bridge. Their presence in the samples was incidental rather than influenced by water quality and the huge population densities would have biased the results. Therefore, corixid numbers were excluded from the data analysis.

Amphipoda (Hyalella azteca and Gammarus lacustris) were found only in samples from the left-bank site at Sturgeon, the first site downstream of the confluence of the Sturgeon River with the North Saskatchewan River. Because the specimens were believed to have come from the tributary, occurrence data were excluded from the North Saskatchewan River data analysis.

Planktonic taxa such as calanoid and cyclopoid copepods, cladocera (e.g., Daphnia spp., Bosmina longirostris, Ceriodaphnia spp., Acroperus harpae, and Pleuroxus procurvus), and rotifera (e.g., Lecane spp., Brachionus spp., Asplanchna sp.) occurred in most samples. Zooplankton, normally part of the lentic communities of lakes ponds, and backwaters, can be carried from these standing waters into rivers, where their recurrence is considered incidental (Hynes 1972, Winner 1975). Because of the uncertainty of origin of North Saskatchewan River zooplankton, these data were omitted from further analysis.

A few taxa were encountered in only one or very few samples. These sporadic occurrences were not meaningful in terms of overall water quality assessment, but were of interest from a general point of view. Ilyocryptus sordidus, a truly benthic cladoceran, possesses red blood pigment and is particularly well adapted to an existence in muddy substrates; a few specimens were collected at Sturgeon, downstream of the confluence of the Sturgeon River with the North Saskatchewan River. Harpacticoida, copepods with benthic habits, occurred sporadically. A few taxa from the phyla Gastrotricha and Tardigrada were recorded.

Two specimens of the parasite Neoechynorhynchus, a member of the phylum Acanthocephala (identification, Dr. D.R. Mudry), were found in samples from Clover Bar and Sturgeon. These Acanthocephalans parasitize suckers and have arthropods (such as amphipods, ostracods, copepods, insect nymphs) as intermediate hosts. One specimen of a cestode belonging to the family Caryophillidae and having tubificids as the intermediate host (Mudry and Arai 1973) was found at Sturgeon. These parasites are rarely found free in the benthos, and their occurrence there is incidental.

3.2 Community Descriptors

The benthic invertebrate fauna of the North Saskatchewan River is diverse and rich. Numerical data which describe the various taxa from all sites sampled in the three seasons are complex. Although much information can be gathered from the analysis of frequency tables for individual taxa, the sheer volume of collected data makes this approach inefficient even when some non-benthic or other incidental species occurrences were eliminated from the data set. Instead, commonly used community parameters such as total number of taxa, total number of specimens per sample, total number of specimens per major taxon, and diversity were used to describe major community changes. Cluster analysis and principal component analysis permitted the grouping of sites with similar invertebrate communities. Additionally, principal component analysis offered an objective way of determining which taxa explain most of the variance in the data sets.

Tables 3 to 5 summarize means and standard errors for the main zoobenthic parameters (i.e., major taxonomic groups, total invertebrate density, Shannon-Wiener diversity, and total number of invertebrate taxa) in the three surveys. The first three parameters were useful descriptors of major trends in the zoobenthic community of the North Saskatchewan River between Devon and Pakan Bridge. There was a trend toward fewer taxa from Rossdale to Sturgeon, particularly at the right-bank site at Rundle Footbridge. However, the trend was inconsistent and its significance is unclear.

3.2.1 Total Numbers

The average total numbers per site for left-bank and right-bank sites in spring, summer, and fall are shown in Figures 2 to 7 and Tables 3 to 5. Total numbers showed a clear pattern in the river between Devon and Pakan Bridge. They were low for right-bank sites upstream of Edmonton and rarely exceeded 200 individuals per sample. A slight increase in numbers occurred at Rossdale (spring, fall), but the increase became more evident at 50th Street Footbridge (summer, fall). In all three seasonal data sets, the Rundle Footbridge right-bank site showed the most dramatic increase in density. At this site, numbers were one to two orders of magnitude higher than at corresponding upstream sites. It was also at the Rundle Footbridge right-bank site that the highest densities per sample were reported for the entire survey: an average of 26,861

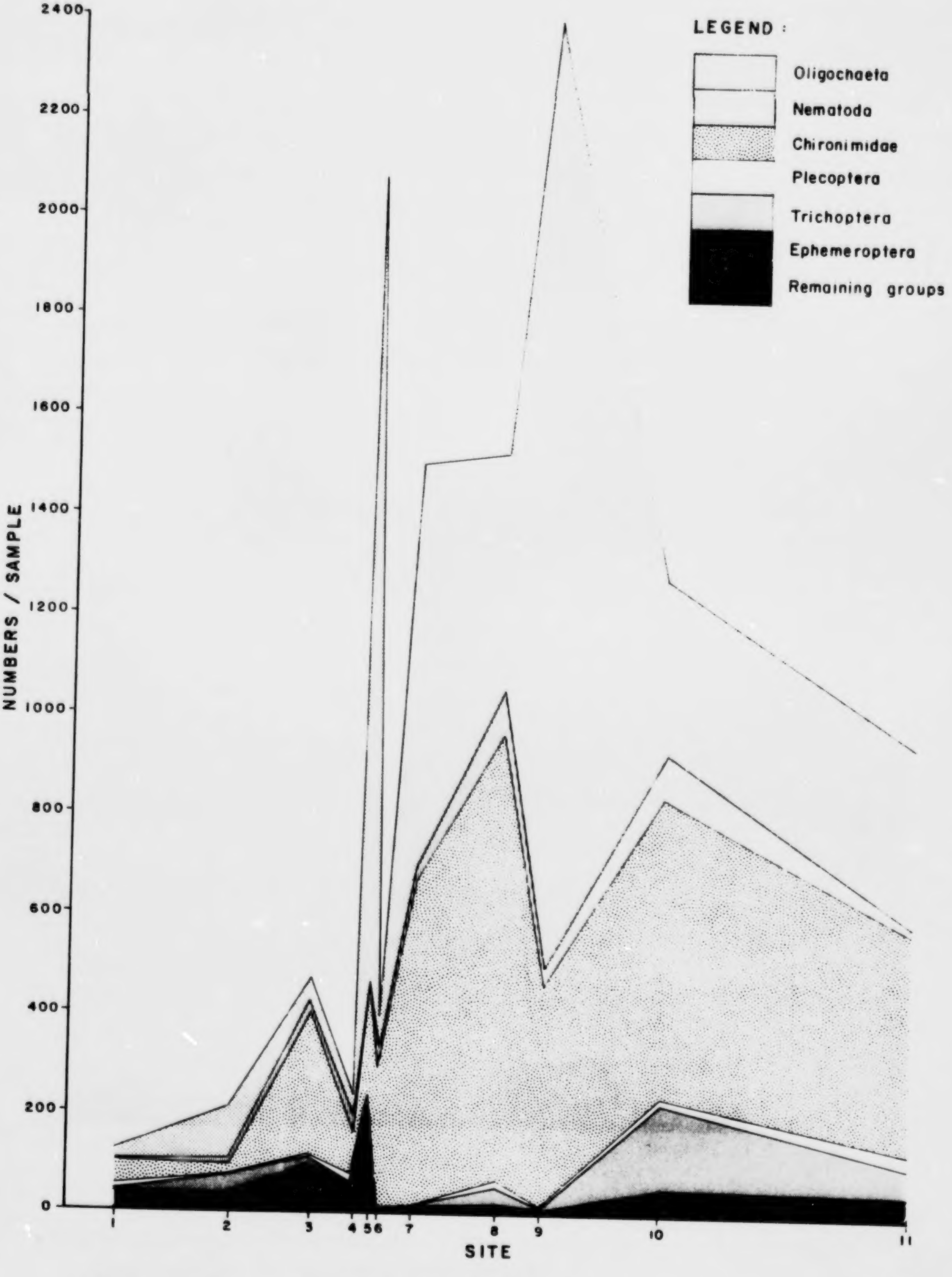


FIGURE 2 . **SPRING RIGHT BANK** : Total invertebrate density and density of major taxa. Refer to Table 1c for site labels.

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

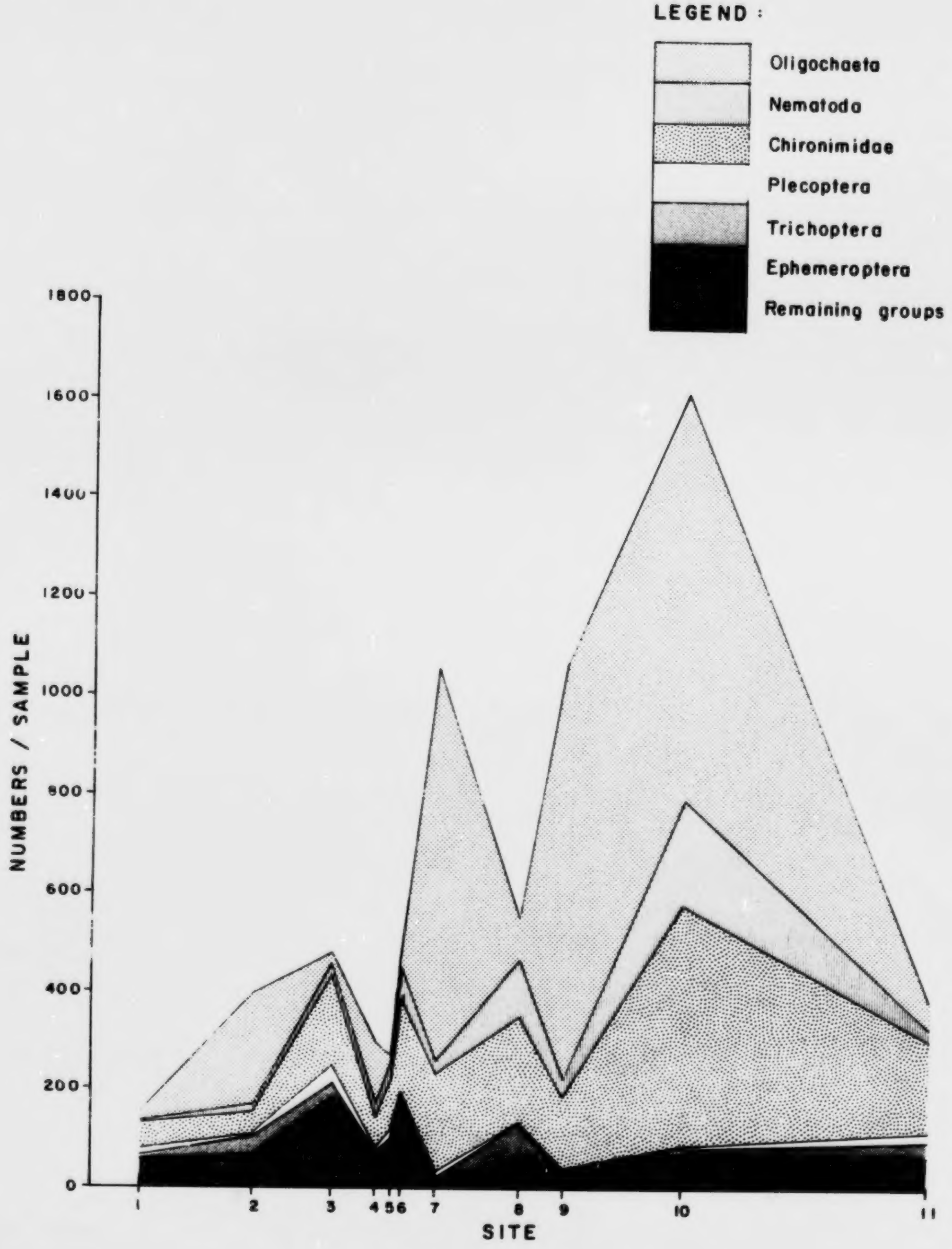


FIGURE 3 . SPRING LEFT BANK : Total invertebrate density and density of major taxa . Refer to Table 1c for site labels.

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

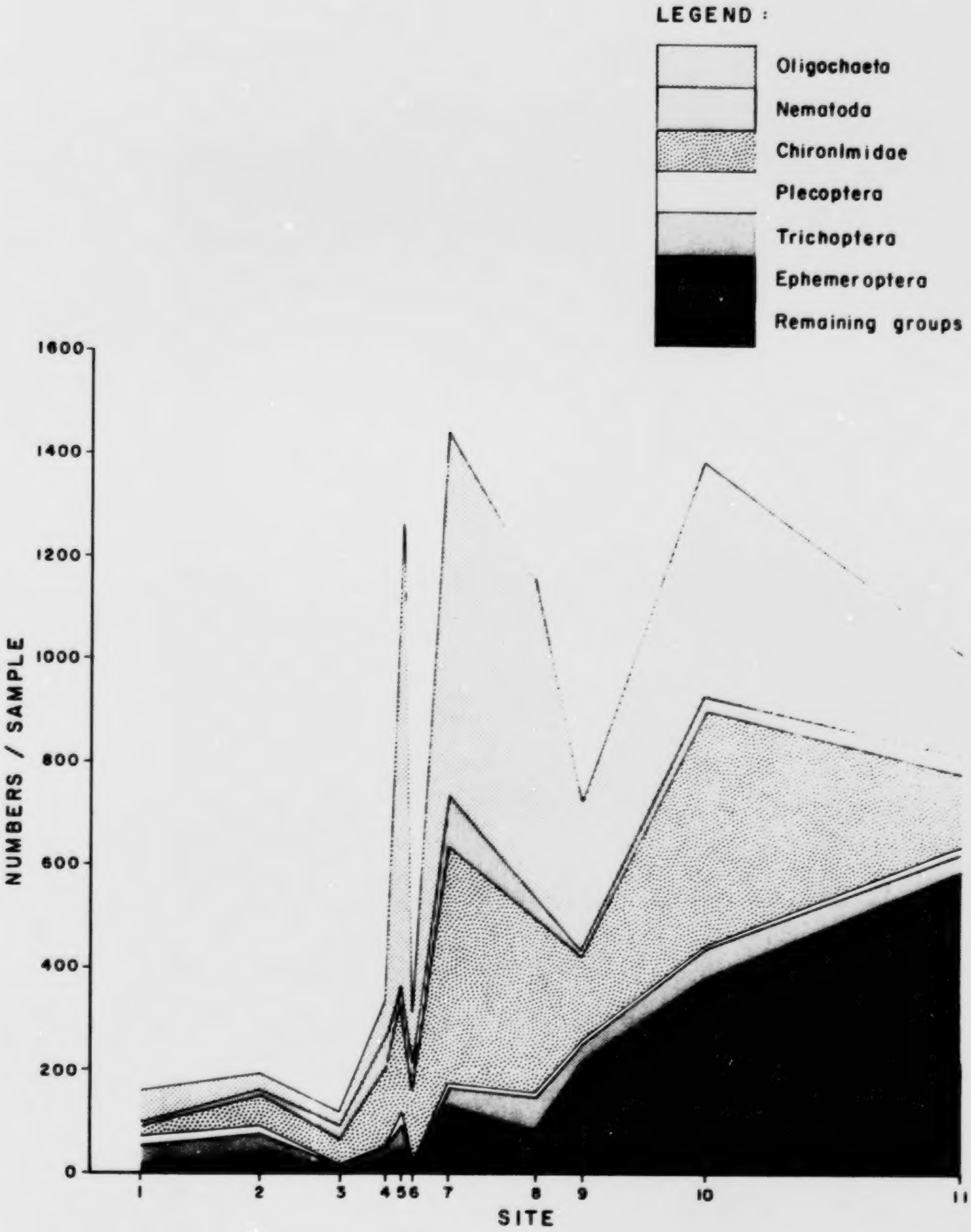


FIGURE 4 . SUMMER RIGHT BANK : Total invertebrate density and density of major taxa .
Refer to Table 1c for site labels.

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

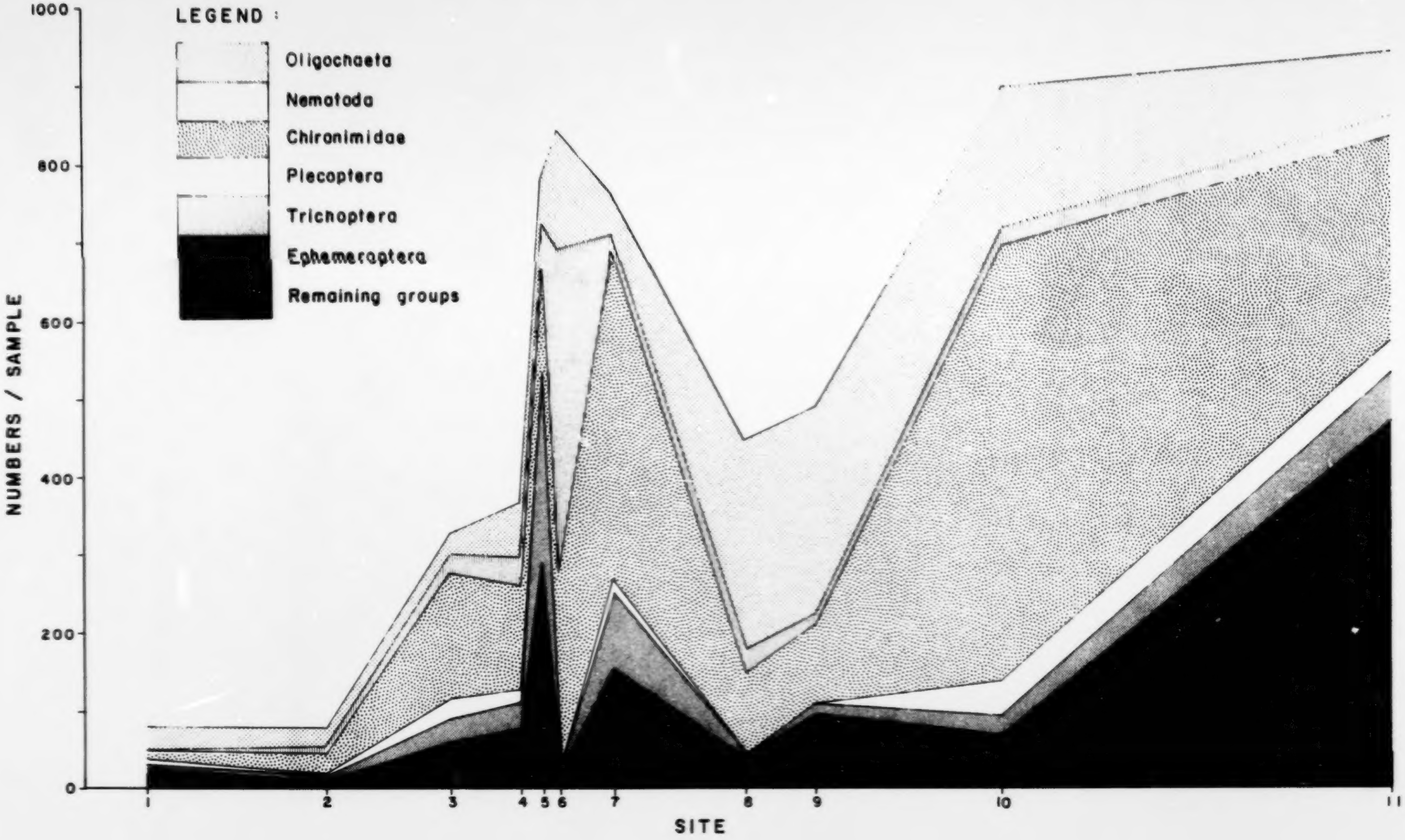


FIGURE 5 . SUMMER LEFT BANK : Total invertebrate density and density of major taxa.
Refer to Table 1c for site labels.

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

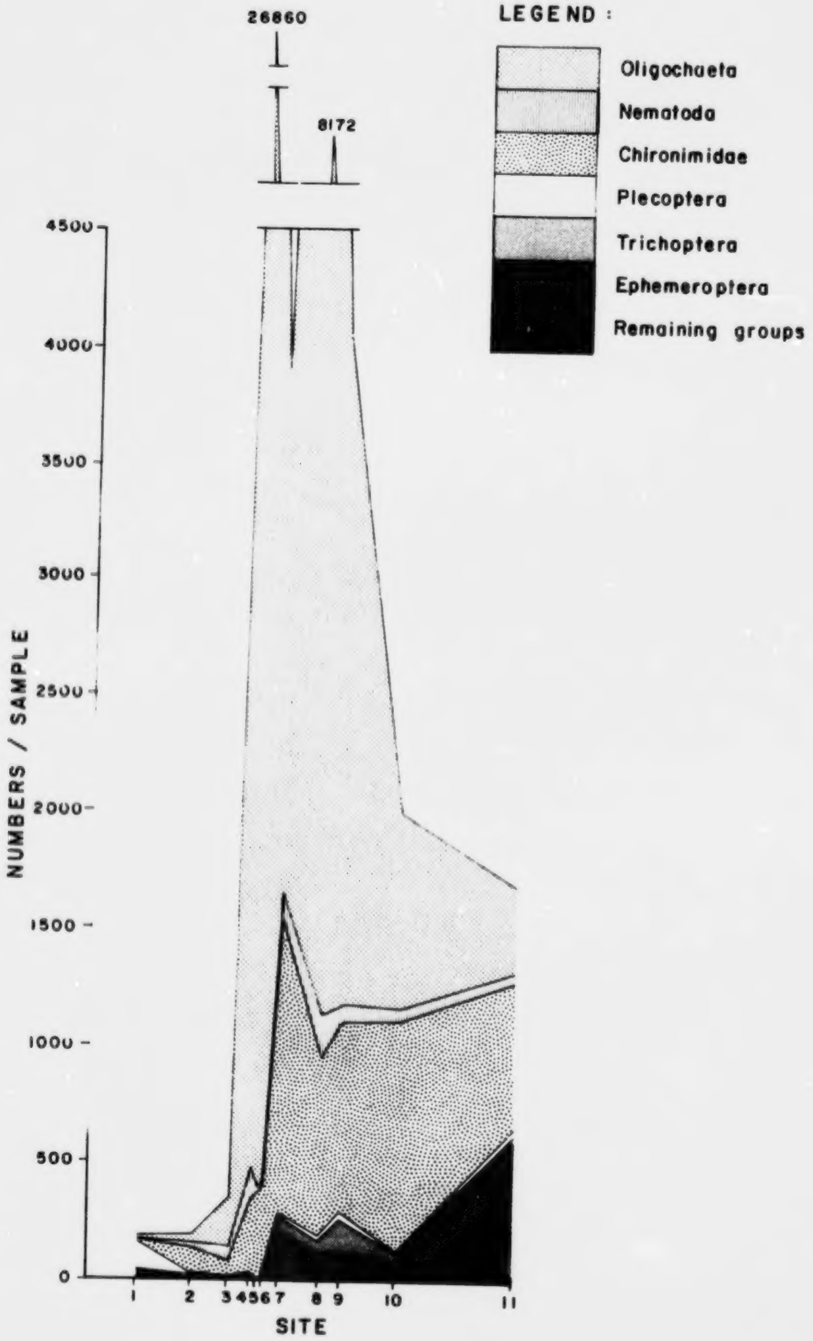


FIGURE 6 . FALL RIGHT BANK : Total invertebrate density and density of major taxa . Refer to Table 1c for site labels.

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

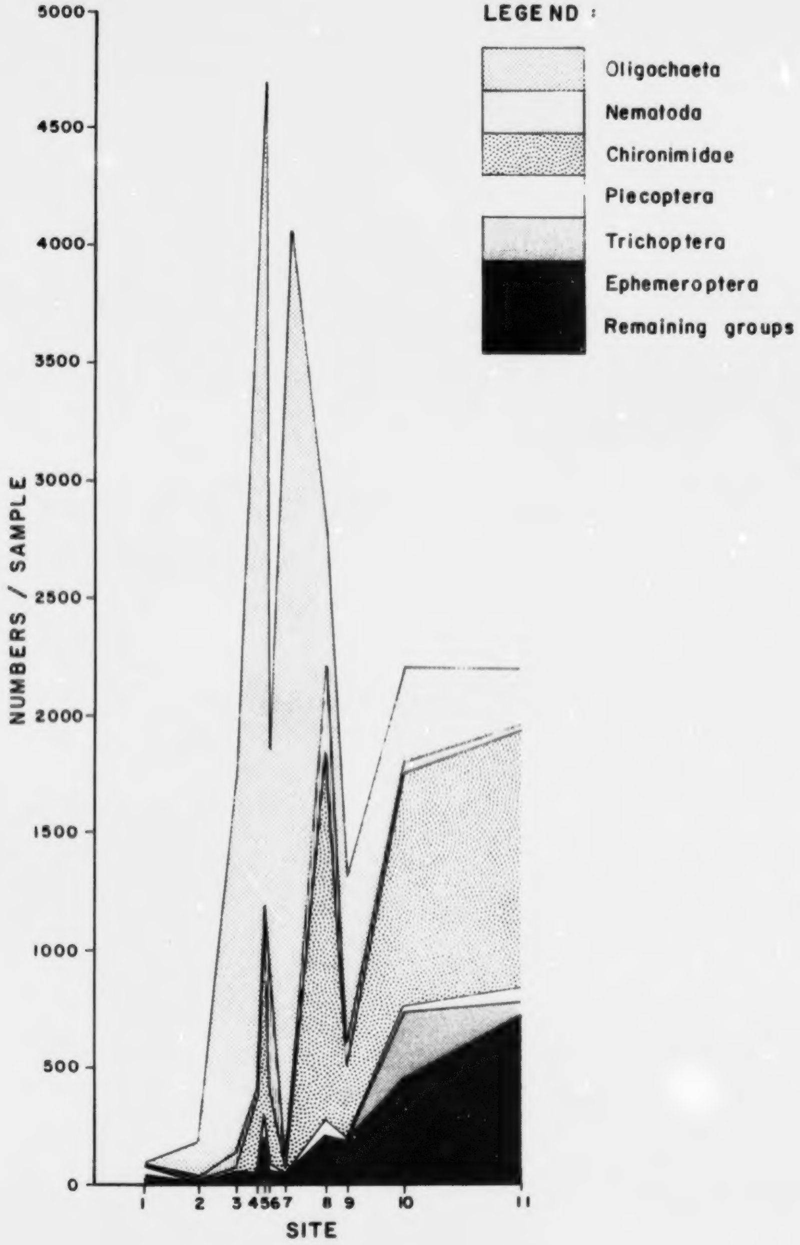


FIGURE 7 . FALL LEFT BANK : Total invertebrate density and density of major taxa . Refer to Table 1c for site labels

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

Table 3. Spring 1982, mean and standard error of major zoobenthic parameters

	Ephemeroptera		Trichoptera		Plecoptera		Nematoda		Oligochaeta		Chironomidae		Total Numbers	
	$\bar{x}$ ±	SE	$\bar{x}$ ±	SE	$\bar{x}$ ±	SE	$\bar{x}$ ±	SE	$\bar{x}$ ±	SE	$\bar{x}$ ±	SE	$\bar{x}$ ±	SE
Devon R*	33.2	6.1	3.2	1.0	8.8	1.3	3.2	1.2	20.6	10.7	49.4	7.7	124.4	19.4
Devon L**	38.2	5.9	8.0	2.3	10.0	3.5	3.8	1.5	14.8	1.5	52.0	6.5	150.2	11.7
E.L. Smith R	26.6	4.4	35.6	4.5	2.0	.8	12.4	1.9	103.2	15.6	18.2	2.6	213.8	28.2
E.L. Smith L	46.8	8.4	33.0	11.2	3.6	1.0	12.4	5.3	229.2	27.6	44.2	2.8	391.6	41.9
Rossdale R	53.0	8.4	13.6	3.3	6.2	1.9	35.0	4.6	44.6	8.2	280.6	20.8	477.8	25.2
Rossdale L	141.2	39.7	25.2	7.1	44.6	14.7	23.8	8.4	36.6	12.3	199.8	44.5	478.6	117.7
50th Street R	55.4	11.2	6.8	2.2	11.2	3.1	34.6	9.3	32.0	5.2	85.0	11.2	233.8	25.3
50th Street L	53.6	13.7	4.0	1.8	2.3	1.1	32.8	4.9	121.4	17.3	61.2	5.5	292.4	28.2
Rundle R	108.8	20.8	12.8	5.0	21.6	8.6	5.6	3.5	1622.8	256.4	218.4	14.2	2078.8	270.9
Rundle L	67.0	13.2	2.0	.5	19.4	3.7	40.4	7.5	9.4	2.2	100.2	20.6	264.4	30.9
Beverly Bridge R	6.0	1.6	1.0	.6	1.0	.8	28.2	1.3	54.2	8.1	295.4	17.6	392.6	21.0
Beverly Bridge L	124.2	19.5	11.4	1.9	15.0	2.7	60.0	15.2	25.6	8.2	188.8	37.2	470.2	77.2
Cloverdale R	9.8	2.7	.4	.4	.2	.2	34.0	8.3	796.8	198.0	651.0	118.7	1503.8	250.9
Cloverdale L	11.2	4.9	.6	.4	3.4	1.4	28.2	13.8	802.0	199.6	201.4	31.9	1054.0	216.8
Ft. Sask. R.	18.6	3.2	32.4	11.6	17.0	3.4	82.4	28.4	470.4	86.9	898.4	84.9	1523.8	88.7
Ft. Sask. L.	46.4	14.0	66.0	24.0	5.4	2.3	115.0	36.5	82.8	20.3	212.6	40.0	546.4	42.6
Sturgeon R	1.8	0.6	.4	.2	3.0	2.1	35.2	12.9	1956.8	454.2	438.4	118.4	2446.0	510.1
Sturgeon L	13.2	7.4	1.2	.7	1.2	.4	35.2	6.3	851.2	292.4	126.2	43.3	1060.8	261.1
Vinca Bridge R	50.4	5.6	177.2	34.8	12.8	2.3	91.2	29.6	332.8	86.5	606.0	26.6	1278.6	101.5
Vinca Bridge L	56.4	6.1	16.2	4.1	5.8	2.6	215.4	37.7	815.8	167.7	489.6	81.9	1610.6	273.9
Pakan Bridge R	35.2	12.3	54.6	15.2	30.6	17.0	22.0	9.8	356.8	227.1	437.0	145.3	945.2	379.1
Pakan Bridge L	59.0	9.4	33.2	13.9	16.4	9.5	22.8	2.5	55.6	14.7	187.4	47.5	381.2	91.9

*R: right bank
**L: left bank

Table 4. Summer 1982, mean and standard error of major zoobenthic parameters

	Ephemeroptera		Trichoptera		Plecoptera		Nematoda		Oligochaeta		Chironomidae		Total Numbers		Total No Taxa		H	
	$\bar{x}$ ±	SE	$\bar{x}$ ±	SE	$\bar{x}$ ±	SE	$\bar{x}$ ±	SE	$\bar{x}$ ±	SE	$\bar{x}$ ±	SE	$\bar{x}$ ±	SE	$\bar{x}$ ±	SE	$\bar{x}$ ±	SE
Devon R*	1.5	1.1	39.0	5.8	14.4	2.2	12.0	3.0	56.0	8.6	19.8	4.9	161.8	18.9	21.6	0.7	3.656	0.057
Devon L**	6.6	1.3	5.0	1.8	5.0	0.7	2.8	1.3	27.8	6.7	13.2	2.0	79.4	5.9	16.0	.5	3.269	0.094
E.L. Smith R	20.0	4.7	41.2	4.8	13.4	2.8	3.6	3.1	30.0	6.0	59.4	6.1	195.0	25.2	25.2	1.5	4.100	0.083
E.L. Smith L	2.6	4.	8.8	6.6	1.6	0.5	8.4	2.0	28.6	10.2	24.4	3.7	77.4	18.6	13.8	1.2	3.091	0.139
Rossdale R	3.0	1.4	8.4	5.2	1.2	0.6	25.2	5.3	31.8	17.6	48.2	29.6	121.0	59.2	14.4	1.9	3.066	0.121
Rossdale L	46.0	8.7	30.2	4.3	25.8	4.6	21.8	3.4	31.6	7.8	159.0	12.3	327.2	33.0	26.8	.7	3.284	0.065
50th Street R	23.6	4.8	21.6	2.5	.8	0.6	65.8	5.0	61.2	11.27	150.0	16.9	332.8	30.8	23.8	.9	3.304	0.050
50th Street L	47.0	14.0	33.2	9.3	14.2	2.6	36.0	10.0	71.6	16.6	137.2	11.7	367.6	29.3	26.6	1.5	3.659	0.069
Rundle R	35.4	3.0	47.8	19.4	20.0	4.6	5.2	2.1	911.6	229.0	240.6	33.2	1262.8	286.1	18.2	1.4	1.900	0.031
Rundle L	276.2	218.4	223.2	180.3	15.6	4.9	42.4	7.2	94.6	20.2	114.2	14.5	783.2	403.3	28.0	1.2	3.400	0.321
Beverly Bridge R	0.6	.4	1.4	1.0	.0	0.0	20.8	5.3	71.0	13.5	161.6	33.6	257.2	48.6	11.2	1.0	2.440	0.100
Beverly Bridge L	11.4	3.0	4.6	1.8	1.6	0.9	417.6	86.4	164.8	24.5	236.0	26.8	841.6	107.5	16.4	1.3	2.278	0.169
Cloverdale R	114.4	21.6	30.6	2.3	3.4	1.5	98.2	11.7	725.0	135.6	463.2	66.0	1440.4	185.4	21.0	1.6	2.527	0.107
Cloverdale L	110.6	17.3	96.6	31.0	19.2	5.0	21.6	9.3	79.2	14.3	420.4	53.5	767.4	65.1	24.8	1.1	2.872	0.103
Ft. Sask. R	186.6	122.4	64.8	31.7	2.8	1.4	44.8	11.1	588.2	185.8	247.6	25.6	1150.6	131.8	24.0	1.8	2.631	0.246
Ft. Sask. L	10.4	1.6	3.6	1.2	0.2	0.2	28.2	9.7	271.0	50.4	104.2	10.5	425.0	6.10	17.2	1.3	2.484	0.138
Sturgeon R	167.8	47.6	36.8	7.6	3.0	1.8	10.2	1.2	325.4	10.8	163.21	16.6	721.8	59.8	24.2	1.3	2.911	0.094
Sturgeon L	43.8	12.8	17.6	4.2	.2	0.2	11.2	4.6	251.6	17.5	98.0	6.1	458.4	27.8	25.0	1.9	3.127	0.228
Vinca Bridge R	361.0	41.5	56.8	17.9	4.6	2.1	29.0	5.4	464.6	47.5	459.2	44.3	1384.2	92.7	24.0	.5	2.835	0.065
Vinca Bridge L	38.4	2.2	24.8	5.1	2.4	0.7	23.4	32.8	185.0	34.1	556.2	51.3	853.2	73.9	22.8	.9	2.702	0.073
Pakan Bridge R	371.8	41.4	35.4	6.1	9.8	2.4	38.2	12.2	186.4	27.5	155.8	13.7	1012.8	48.9	25.4	.2	3.373	0.110
Pakan Bridge L	426.0	79.6	63.6	22.0	43.0	18.4	22.4	5.5	85.8	4.3	261.8	34.5	944.8	126.7	27.0	2.0	3.532	0.117

*R: right bank
**L: left bank

Table 5. Fall 1982, mean and standard error of major zoobenthic parameters

	Ephemeroptera		Trichoptera		Plecoptera		Nematoda		Oligochaeta		Chironomidae		Total Numbers	
	$\overline{x}$ ±	SE	$\overline{x}$ ±	SE	$\overline{x}$ ±	SE	$\overline{x}$ ±	SE	$\overline{x}$ ±	SE	$\overline{x}$ ±	SE	$\overline{x}$ ±	SE
Devon R*	28.8	14.4	6.0	0.9	112.4	22.1	3.2	1.0	11.8	3.2	12.8	3.7	218.2	45.7
Devon L**	16.6	2.1	2.4	0.9	27.0	3.2	.8	0.2	10.2	3.3	8.4	1.9	90.4	4.0
E.L. Smith R.	.8	0.2	0.2	0.2	3.6	2.0	21.6	5.3	30.8	4.7	113.6	25.5	184.2	4.3
E.L. Smith L.	.0	0.0	0.2	0.2	0.8	0.5	14.2	3.0	144.4	29.4	7.8	2.0	179.8	33.7
Rossdale R	1.4	0.5	0.0	0.0	1.6	0.4	64.4	12.6	205.4	37.9	66.4	7.5	349.2	56.5
Rossdale L	.2	0.2	0.4	0.2	0.2	0.2	68.8	20.5	1589.0	262.4	19.2	7.6	1724.2	266.3
50th Street R	16.0	7.8	0.4	0.2	1.0	0.3	136.8	9.1	3851.6	492.3	328.2	65.4	4349.6	485.9
50th Street L	3.4	1.0	0.4	0.2	1.2	0.2	36.8	6.6	4304.8	749.2	312.0	81.6	4694.4	817.9
Rundle R	.8	0.6	0.2	0.2	0.6	0.4	18.8	4.4	26470.4	4000.8	364.2	128.3	26861.0	3984.3
Rundle L	104.6	11.3	2.2	1.0	72.4	5.0	87..2	7.9	2832.8	204.8	824.4	75.2	4036.8	265.9
Beverly Bridge R	5.0	1.0	.2	0.2	0.4	0.2	30.4	4.7	7876.8	558.8	375.8	40.6	8308.2	576.4
Beverly Bridge L	27.2	13.5	1.6	1.4	11.2	3.4	44.8	6.5	1418.4	247.1	332.0	54.4	1871.0	268.6
Cloverdale R	75.2	26.4	66.8	21.5	6.6	2.1	102.4	24.0	2202.8	411.5	1260.6	192.7	3876.6	424.1
Cloverdale L	.8	0.6	.4	0.4	0.2	0.2	23.2	4.6	3999.2	680.1	19.2	5.0	4074.4	690.5
Ft. Sask. R	72.6	28.1	51.4	20.0	15.2	4.8	181.6	36.5	7040.0	2154.4	760.0	162.4	8379.2	1947.7
Ft. Sask. L	106.2	37.2	4.6	1.2	9.8	3.7	72.3	72.3	558.4	181.1	1577.0	223.2	2800.2	435.8
Sturgeon R	88.4	21.4	131.6	33.2	8.8	2.2	77.6	17.0	2864.0	1246.0	806.4	96.4	4143.2	1146.5
Sturgeon L	42.2	24.9	8.4	3.7	4.8	2.1	79.2	10.2	719.2	140.1	312.4	54.8	1369.8	211.1
Vinca Bridge R	73.8	6.7	35.8	7.0	0.8	0.2	51.6	11.2	836.8	48.0	977.4	55.6	2005.0	70.3
Vinca Bridge L	434.8	57.3	286.2	69.4	2.0	44.0	2.7	2.7	406.4	111.9	993.2	118.9	2517.4	71.0
Pakan Bridge R	568.8	156.7	31.2	11.2	27.2	8.2	40.8	16.1	361.6	75.5	622.4	99.2	1679.0	263.9
Pakan Bridge L	646.4	149.2	64.8	30.8	58.4	17.3	31.2	9.1	251.2	33.5	1096.8	92.9	2288.4	190.0

*R: right bank
**L: left bank

specimens per sample in the fall. Densities remained high for all right-bank sites downstream of Rundle Footbridge except Beverly Bridge, where lower numbers occurred in spring and summer. There was a slight decline in average densities per site at Pakan Bridge.

The trend for left-bank sites was similar to that observed for the right-bank sites. Although increases in numbers per sample were less pronounced for left-bank sites, the changes were evident somewhat further upstream (i.e., at Rossdale). The highest total numbers for left-bank sites (4,800 specimens per sample at 50th Street) were also encountered in the fall.

3.2.2 Number of Individuals Per Major Taxon

The distribution of numbers among taxa is presented in Figures 2 to 7; basic statistics for individual parameters are given in Tables 3 to 5.

A progressive change was evident in the community composition from upstream sites to downstream sites. Chironomidae, Oligochaeta and Nematoda commonly represented about half of total numbers at Devon; the other half was composed mainly of Plecoptera, Ephemeroptera, Trichoptera, and a variety of taxa included as "remaining groups". In downstream direction and within the city limits, the number of chironomids, nematodes and especially oligochaetes often increased dramatically. These three groups represented up to 98% of the total numbers. Consequently, the percentage of mayflies, stoneflies and caddisflies was less than 5%, particularly at right-bank sites, even though the actual numbers for these three groups were usually slightly higher than at Devon. Further downstream, a second major change occurred when numbers of stoneflies, mayflies, caddisflies, and "remaining groups" showed much larger increases. However, numbers of chironomids, oligochaetes and nematodes also remained high. The ratios of numbers for major taxa to total numbers were comparable for Devon and Pakan Bridge, even though actual numbers were more than an order of magnitude greater at Pakan Bridge.

The locations at which these shifts in community composition occurred varied from left bank to right bank, and from one sampling period to another. In general the number of Chironomidae, Oligochaeta, and Nematoda increased downstream from Rossdale at left-bank sites, and increased downstream from 50th Street Footbridge at right-bank sites. The increase in Ephemeroptera, Plecoptera, and Trichoptera numbers was evident as far upstream as Clover Bar for left-bank sites; at right-bank sites, these numbers did not increase appreciably before Vinca Bridge.

3.2.3 Shannon-Wiener Diversity

Figure 8 summarizes average values for the Shannon-Wiener diversity index for left-bank and right-bank sites for the three sampling periods. Basic statistics for this parameter are given in Tables 3 to 5.

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

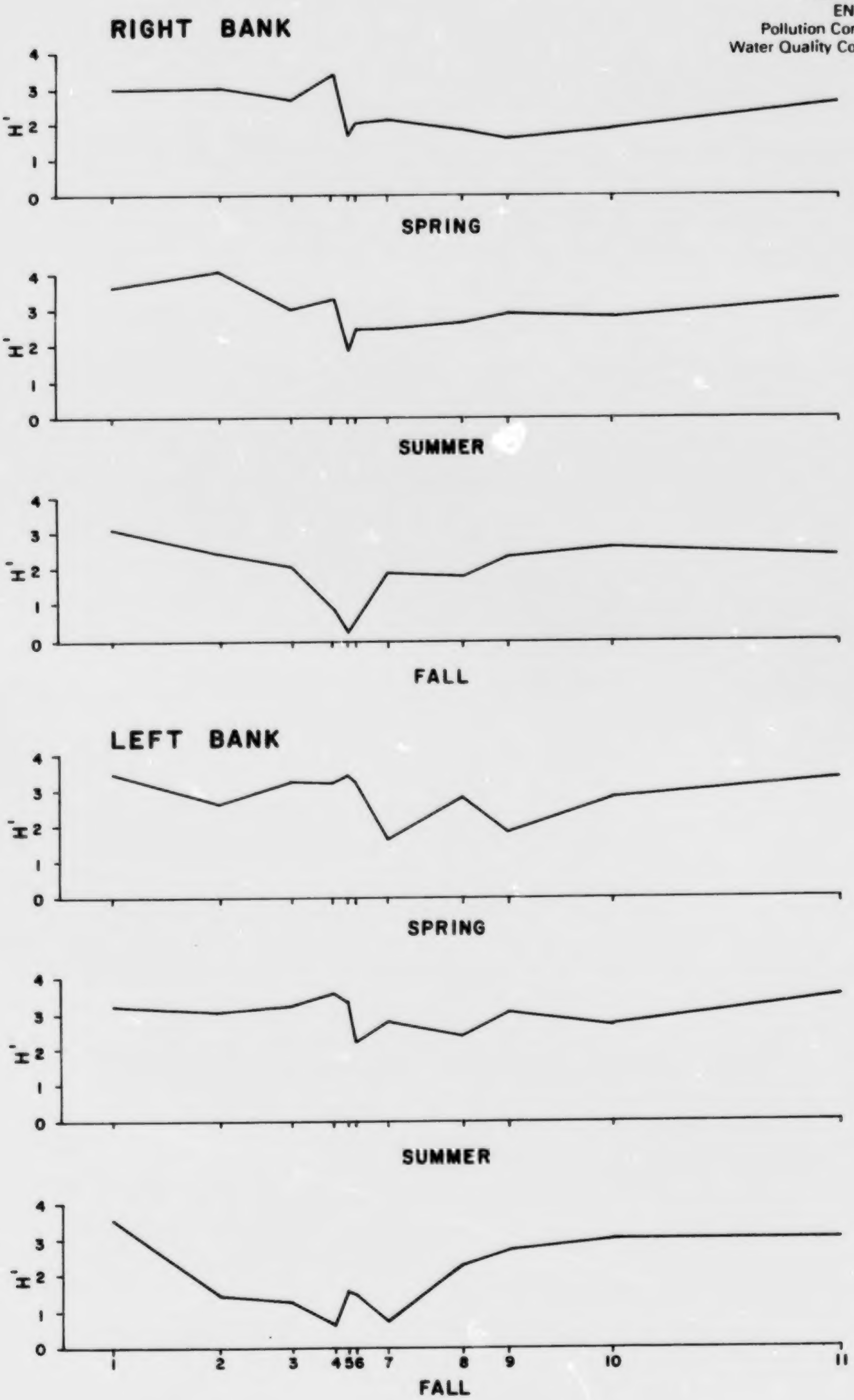


FIGURE 8 . SHANNON-WIENER DIVERSITY (H') .
Refer to Table 1c for site labels.

Diversity values calculated for the benthic invertebrate community of the North Saskatchewan River between Devon and Pakan Bridge ranged from a maximum of 4.100 at E.L. Smith (summer, right-bank site) to a minimum of 0.234 at Rundle Footbridge (fall, right-bank site). The patterns exhibited by the Shannon-Wiener diversity index in downstream direction were similar for all three data sets, although variations were more pronounced in the fall.

Right-bank sites upstream of Edmonton had the highest diversity values. H' declined gradually in downstream direction, and lowest values occurred at Rundle Footbridge. Values for H' remained low between Rundle Footbridge and Sturgeon in the spring, whereas a gradual increase in H' occurred from Rundle Footbridge downstream in summer and fall. Diversity values for the most downstream right-bank sites (Vinca Bridge and Pakan Bridge) were comparable to the values for Devon or E.L. Smith in the corresponding seasons.

For left-bank sites, diversity remained fairly stable in downstream direction until Beverly Bridge in spring or Rundle Footbridge in summer. Lowest H' values for these seasons occurred at the next downstream site in each case (i.e., Clover Bar and Beverly Bridge, respectively). Downstream of the latter two sites, diversity values increased irregularly. The pattern for the fall differed from those for spring and summer by the sudden drop in diversity at E.L. Smith and the persistence of low values until Clover Bar. Similar to right-bank sites, the diversity values for the most downstream left-bank sites were comparable to the values for Devon.

3.3 Multivariate Analyses

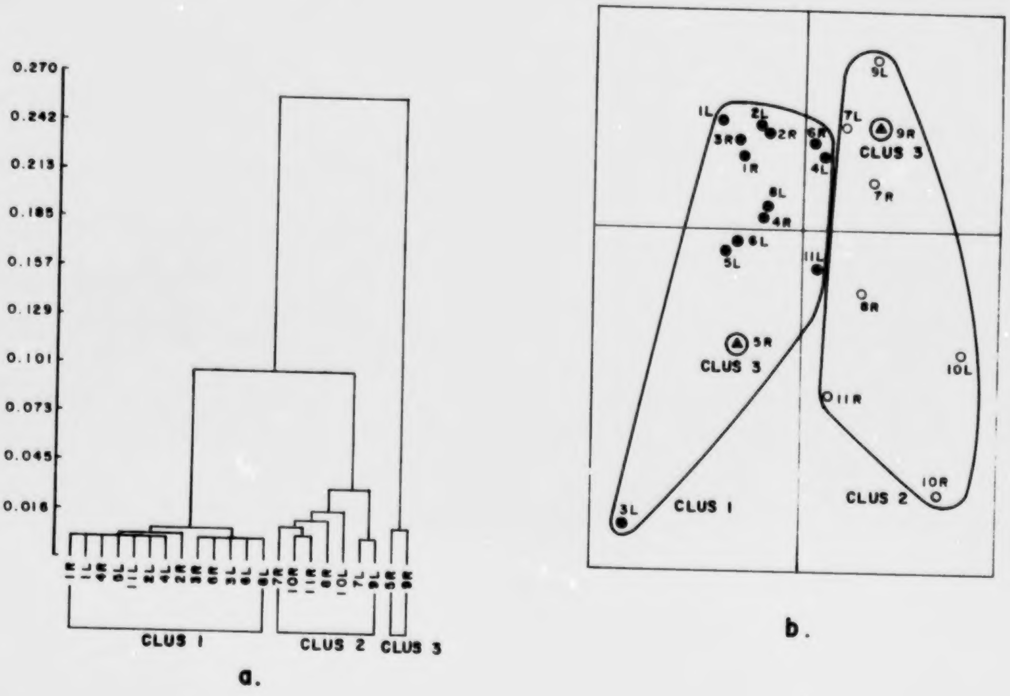
3.3.1 Cluster Analysis

The results of cluster analyses are presented as dendrograms in Figures 9, 10, and 11 for spring, summer, and fall, respectively.

The cluster analysis of spring data identified 3 major clusters. The first cluster (clus-1) grouped all sites from Devon to 50th Street Footbridge, the left-bank site at Rundle Footbridge, all sites at Fort Saskatchewan and Pakan Bridge, and both sites at Beverly Bridge. Clus-2 grouped both sites at Clover Bar, both sites at Vinca Bridge, the right-bank site at Fort Saskatchewan, and the left-bank site at Sturgeon. Clus-3 grouped the right-bank sites at Rundle and Sturgeon.

The cluster analysis of the summer data identified only two clusters. Clus-1 grouped all sites except the Sturgeon left-bank site, which constituted clus-2.

Three major clusters were identified by the analysis of the fall data set. Clus-1 and clus-2 resulted from the fusion of several sub-clusters. The differences in similarity coefficients at the fusion points of these sub-clusters were too small to be significant. However, for reasons which will become apparent later (results of principal component analysis), clus-1 was divided into clus-1a, comprised of sites upstream of Edmonton, and clus-1b, comprised of all sites downstream of Edmonton (i.e., downstream of sites in clus-2 and clus-3). Specifically, clus-1a grouped both sites at Devon, both



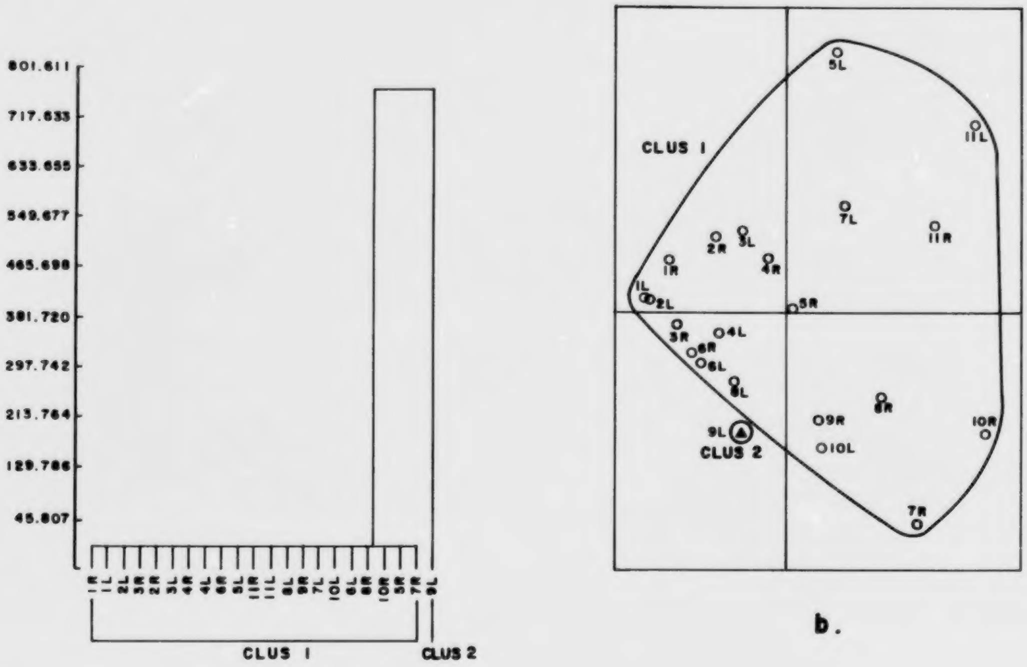
a. Cluster analysis.

b. Principal component analysis:
site groups are those identified in spring cluster analysis.

Refer to Table 1c for site labels.

FIGURE 9. MULTIVARIATE ANALYSIS OF ZOOBENTHIC DATA FROM SPRING 1982

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch



a.

b.

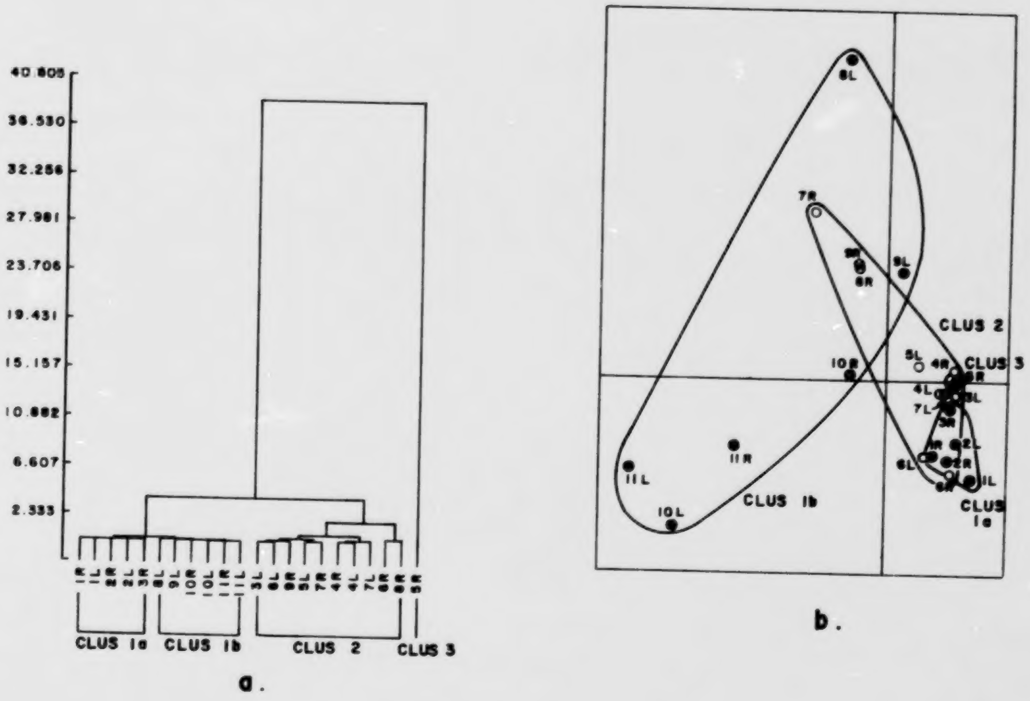
a. Cluster analysis.

b. Principal component analysis :
site groups are those identified in summer cluster analysis.

Refer to Table 1c for site labels.

FIGURE 10. MULTIVARIATE ANALYSIS OF ZOOBENTHIC DATA FROM SUMMER 1982

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch



a. Cluster analysis.

b. Principal component analysis:
site groups are those identified in fall cluster analysis.

Refer to Table 1c for site labels.

FIGURE 11. MULTIVARIATE ANALYSIS OF ZOOBENTHIC DATA FROM FALL 1982

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

sites at E.L. Smith, and the right-bank site at Rossdale; clus-1b grouped both sites at Vinca Bridge, both sites at Pakan Bridge, and the left-bank sites at Fort Saskatchewan and Sturgeon; clus-2 grouped all sites from 50th Street Footbridge to Clover Bar, the left-bank site at Rossdale, and the right-bank site at Sturgeon; clus-3 consisted of the right-bank site at Rundle Footbridge.

3.3.2 Principal Component Analysis

The eigenvalues[1] and percentage variance explained by each principal component in the analysis of spring, summer, and fall data are given in Table 6. The first two principal components explained the largest proportion of the sample variance. Because the third principal component also explained a considerable fraction of the variance, it was included in the analysis.

Taxa which accounted for most of the variance in each principal component are listed in Table 7; the eigenvector values are also given.

3.3.3 Major Characteristics of the Taxa identified by Principal Component Analysis

An appraisal of the list of taxa identified by PCA as being the most critical in the data set (Table 7) showed that a total of 31 different taxa had high eigenvector[1] values in the data sets for the three sampling seasons. Some of these taxa (i.e., Tricorythodes,

---

[1] See Section 2.4.1 of Methods for Definitions

TABLE 6 Eigen values and percentage variance explained by each eigenvector for Spring, Summer, and Fall data.

SPRING Eigen Values											
5.96	4.16	3.11	2.36	1.99	1.74	1.48	1.29	1.13	0.87	0.85	0.64
0.37	0.35	0.24	0.14	0.12	0.10	0.06	0.04	0.01	0.00	0.00	0.00
0.00	-0.00	-0.00	-0.00								
Percentage Variance											
21.27	14.87	11.10	8.41	7.11	6.22	5.27	4.53	4.04	3.10	3.05	2.29
1.34	1.24	0.86	0.50	0.43	0.34	0.22	0.13	0.03	0.00	0.00	0.00
0.00	-0.00	-0.00	-0.00								
SUMMER Eigen Values											
6.11	4.62	2.99	2.02	1.68	1.53	1.33	1.08	0.87	0.84	0.57	0.38
0.28	0.26	0.20	0.14	0.07	0.02	0.01	0.00	0.00	0.00	0.00	0.00
0.00											
Percentage Variance											
24.43	18.50	11.97	8.07	6.71	6.10	5.34	4.33	3.47	3.37	2.30	1.51
1.11	1.05	0.78	0.57	0.26	0.07	0.03	0.02	0.01	0.00	0.00	0.00
0.00											
FALL Eigen Values											
8.01	4.28	3.08	2.51	1.99	1.53	1.44	1.19	0.96	0.87	0.61	0.45
0.36	0.28	0.25	0.11	0.04	0.01	0.01	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00							
Percentage Variance											
27.62	14.75	10.63	3.66	6.88	5.29	4.38	4.09	3.31	3.01	2.10	1.54
1.26	0.96	0.86	0.39	0.12	0.05	0.03	0.01	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00							

TABLE 7. List of taxa which have high positive or negative scores for first three vectors

VECTOR 1	VECTOR 2	VECTOR 3
Spring 21% (*)	Spring 15% (*)	Spring 11% (*)
Chironomini 0.328	Tanytarsini 0.194	Naididae 0.337
Tubificidae 0.272	Ceratopogonidae 0.111	Turbellaria 0.311
Mermithoidea 0.241	Isoperla -0.392	Chironomid pupae 0.298
Tanypodinae 0.238	Chironomid pupae -0.347	Tubificidae 0.218
Tricorythodes 0.238	Tanypodinae -0.299	Acari -0.365
Psychomyia 0.222	Hydropsychidae -0.273	Enchytraeidae -0.318
Ferrissia 0.217	Psychomyia -0.265	Glossosoma -0.302
Baetis -0.300		Nematoda -0.278
Alloperla -0.296		
Rhithrogena -0.287		
Heptageniidae -0.242		
Summer 21% (*)	Summer 19% (*)	Summer 12% (*)
Tricorythodes 0.339	Unid. Plecoptera 0.329	Hycropsychidae 0.462
Tanpodinae 0.297	Ephemeroptera Nymphules 0.304	Orthocladiinae 0.318
Heptageniidae 0.296	Centroptilum 0.296	Chironomid pupae 0.321
Pseudocleon 0.280	Acari 0.248	Naididae 0.310
Orthocladiinae 0.280	Ferrissia -0.269	Tubificidae -0.292
Enchytraeidae -0.247	Chironomid pupae -0.250	Psychomyia -0.257
	Tubificidae -0.226	Tricorythodes -0.217
	Tanypodinae -0.224	
Fall 28% (*)	Fall 15% (*)	Fall 11% (*)
Enchytraeidae 0.200	Enchytraeidae 0.194	Elmidae 0.445
Tricorythodes -0.310	Psychomyia 0.279	Caenis 0.444
Heptagenia -0.310	Mermithoidea -0.397	Tanytarsini 0.292
Isoperla -0.303	Capniidae -0.384	Tubificidae 0.187
	Ferrissia -0.380	Enchytraeidae -0.231
	Orthocladiinae -0.331	Chloroperlidae -0.293
		Rhithrogena -0.322

(*) indicates the variance explained by each individual vector.

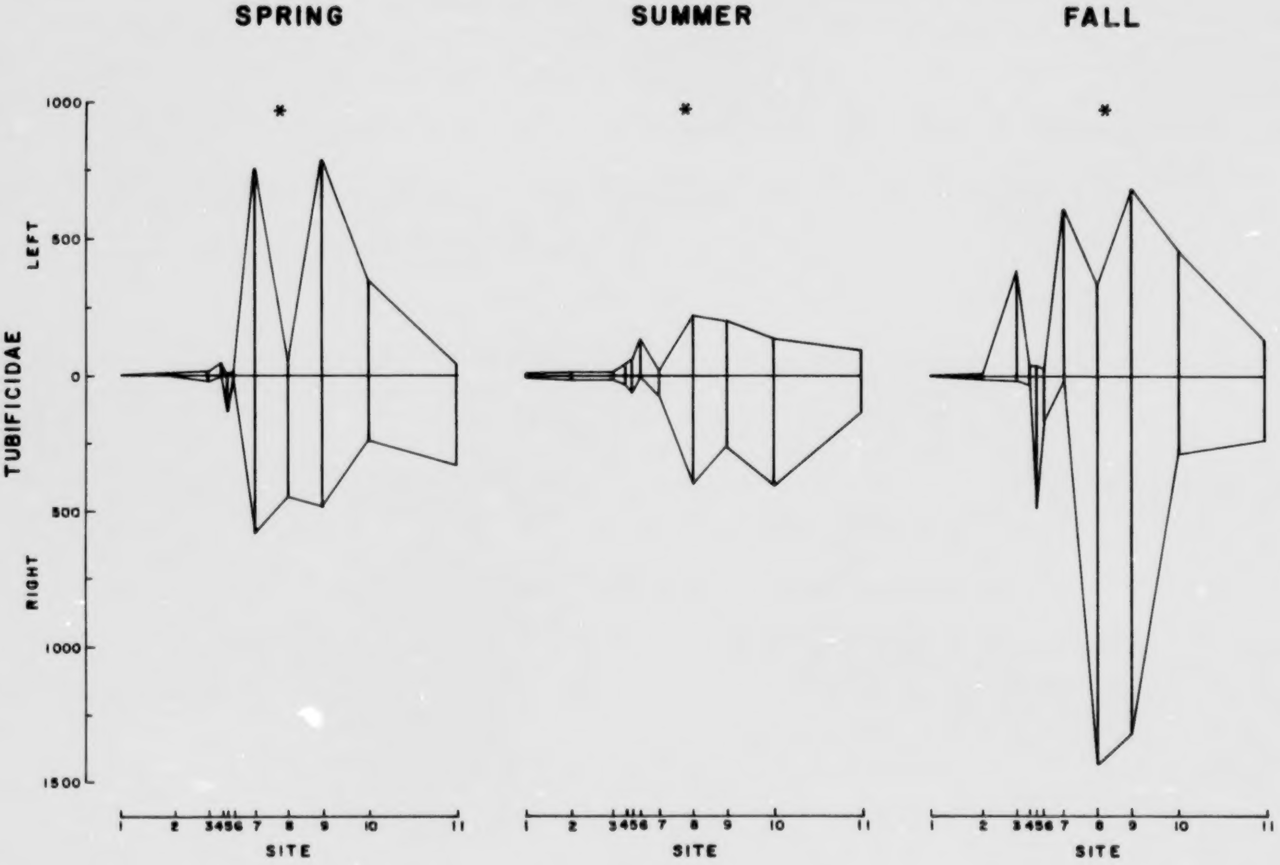
Ferrissia, *Psychomyia*, Enchytraeidae, and Tubificidae) explained a large portion of the variance in all three data sets; some taxa accounted for a large fraction of the variance in two data sets (i.e., *Rhithrogena*, Heptageniidae, Hydropsychidae, *Isoperla*, Tanytarsini, Tanypodinae, Orthocladiinae, Chironomidae pupae, Naididae, Mermithoidea, and Acari). The remaining taxa explained a large portion of the variance in only one data set (i.e., *Baetis*, *Caenis*, *Centroptilum*, *Heptagenia*, *Pseudocleon*, Ephemeroptera nymphules, *Glossosoma*, *Alloperla*, Capniidae, Chloroperlidae, undetermined Plecoptera, Ceratopogonidae, Chironomini, Nematoda, and Elmidae).

In general, benthic invertebrates will show one of three responses to effluent discharge, depending on the nature of the discharge:

- a positive response (i.e., numbers increase downstream of the discharge)
- a negative response (i.e., numbers decrease downstream of the discharge)
- no change (i.e., no change in numbers downstream of the discharge)

A further distinction can be made in the first 2 types of response between taxa which show a gradual response and those which show a sudden, though possibly short-lived, response. The densities of taxa illustrating each type of response in the North Saskatchewan River are shown in Fig. 12.

Most taxa showed a gradual, positive response. Three of the five taxa identified in spring, summer, and fall by principal component analysis were the most typical examples of this type of response. *Tricorythodes*, *Ferrissia*, and *Psychomyia* were present at



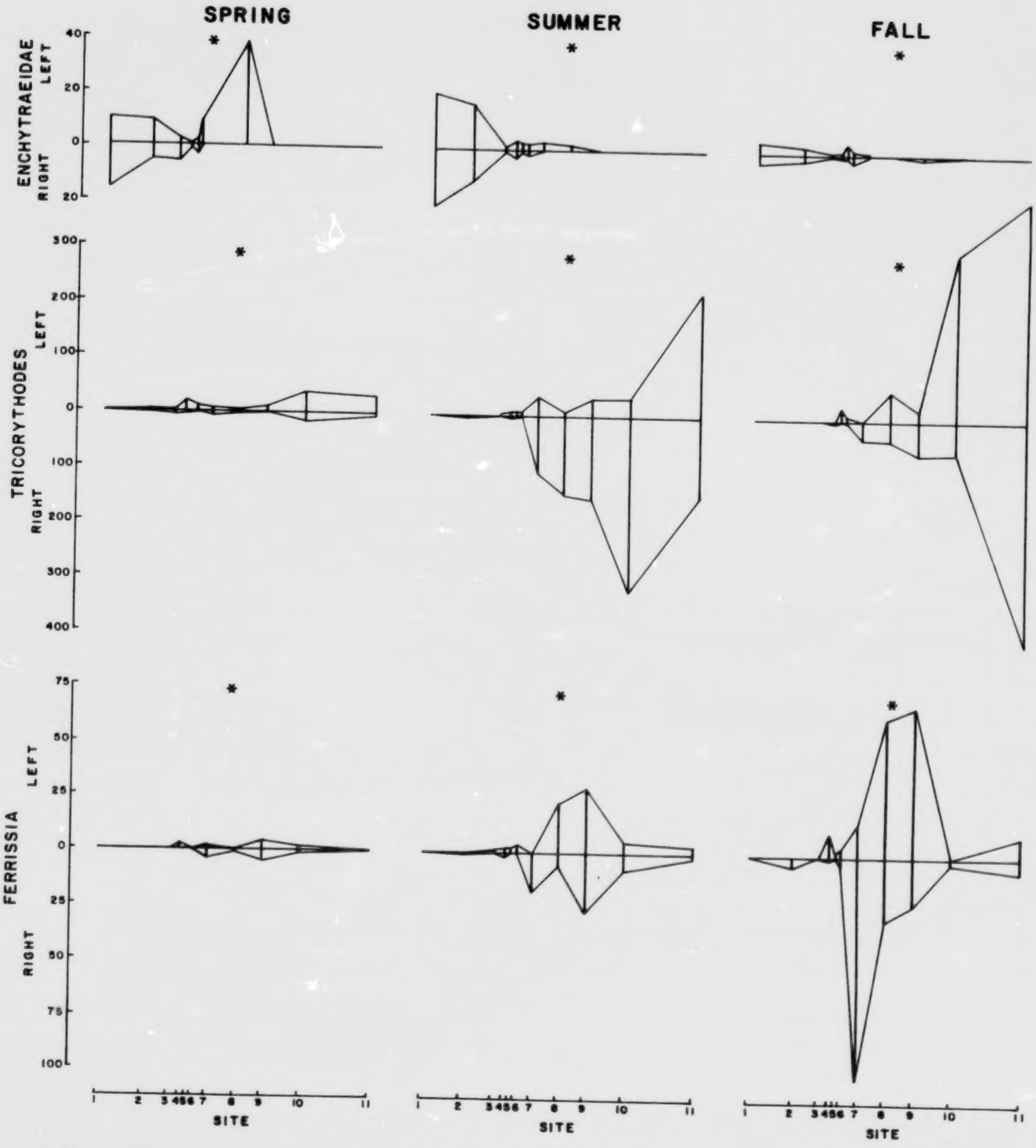
SPRING SUMMER FALL

* Indicates the season in which a taxon explains a large fraction of the sample variance .

FIGURE 12 . TAXA SHOWING CHARACTERISTIC DENSITY CHANGES IN THE NORTH SASKATCHEWAN RIVER IN THE VICINITY OF EDMONTON .

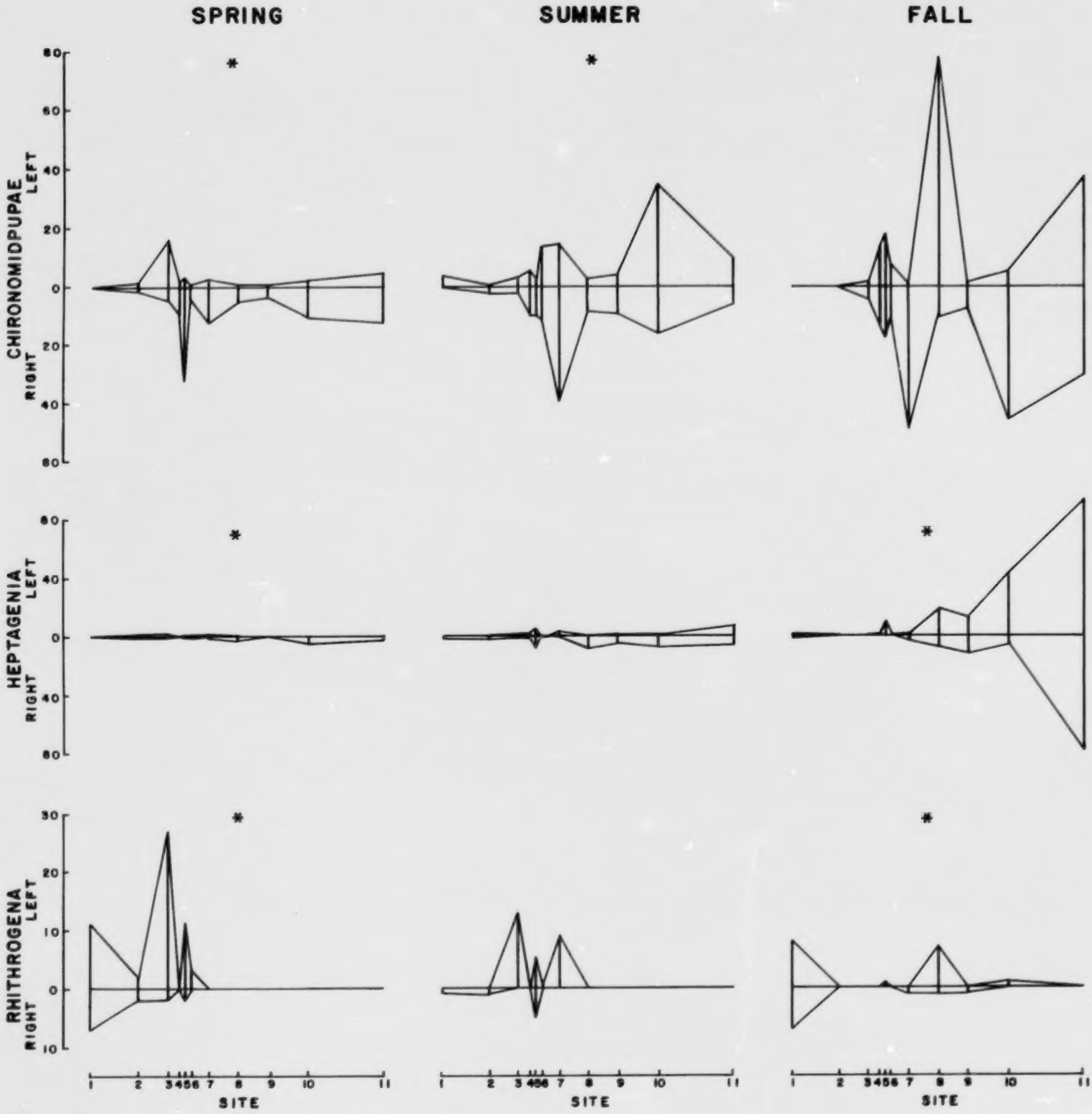
Refer to Table 1c for site labels.

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch



* Indicates the season in which a taxon explains a large fraction of the sample variance .

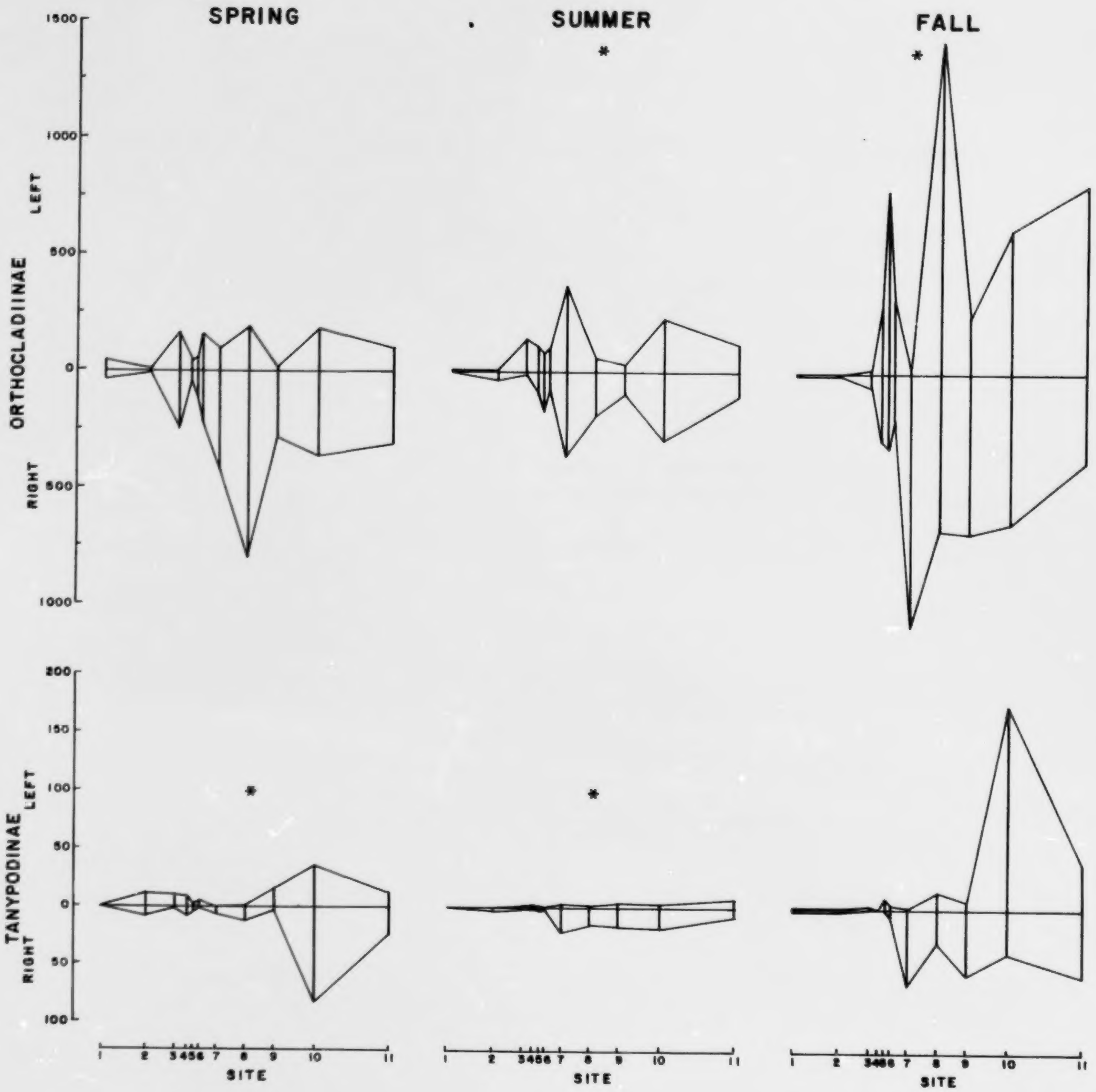
FIGURE 12 Continued .



* Indicates the season in which a taxon explains a large fraction of the sample variance .

FIGURE 12 Continued .

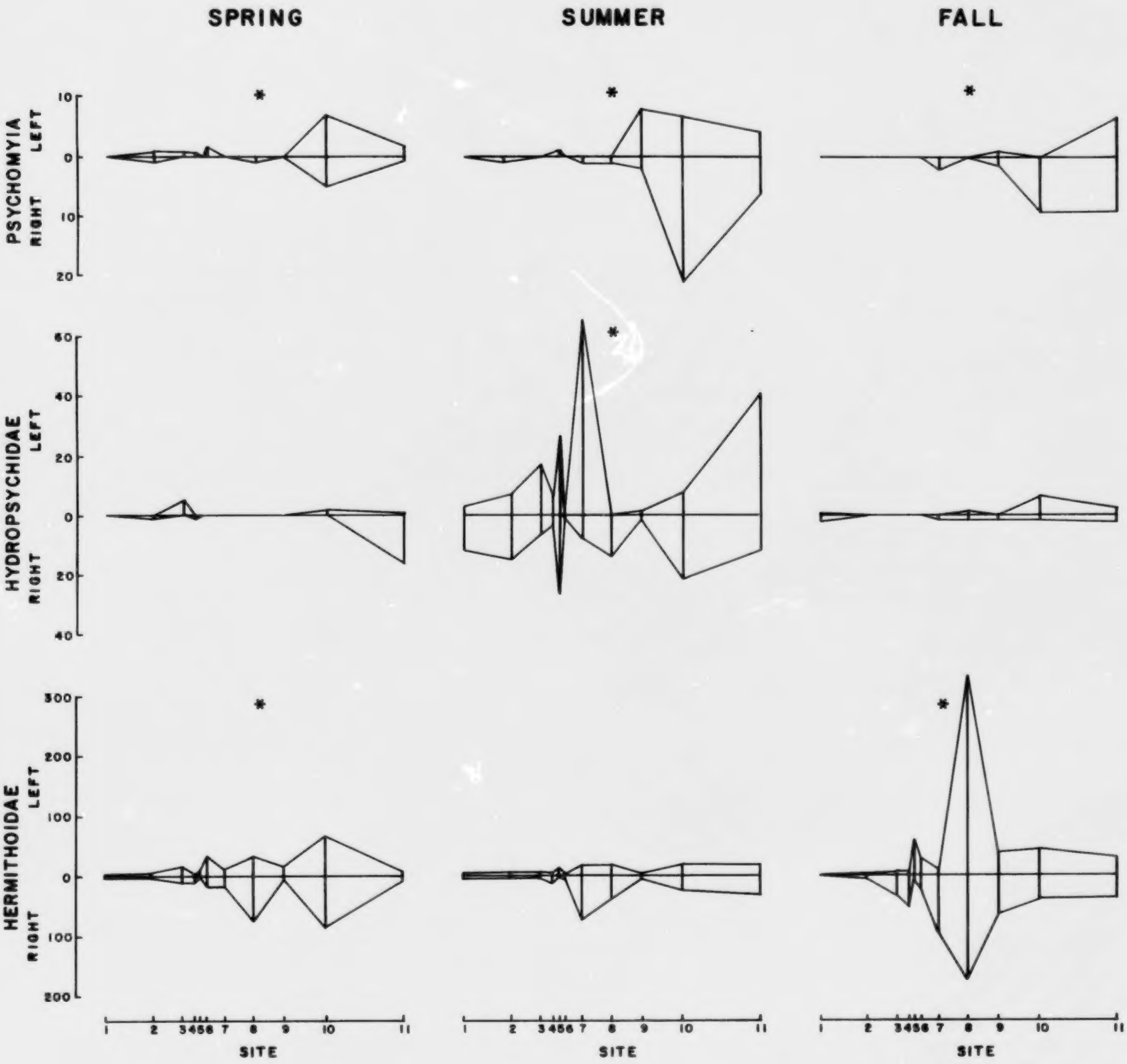
Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch



* Indicates the season in which a taxon explains a large fraction of the sample variance .

FIGURE 12 Continued .

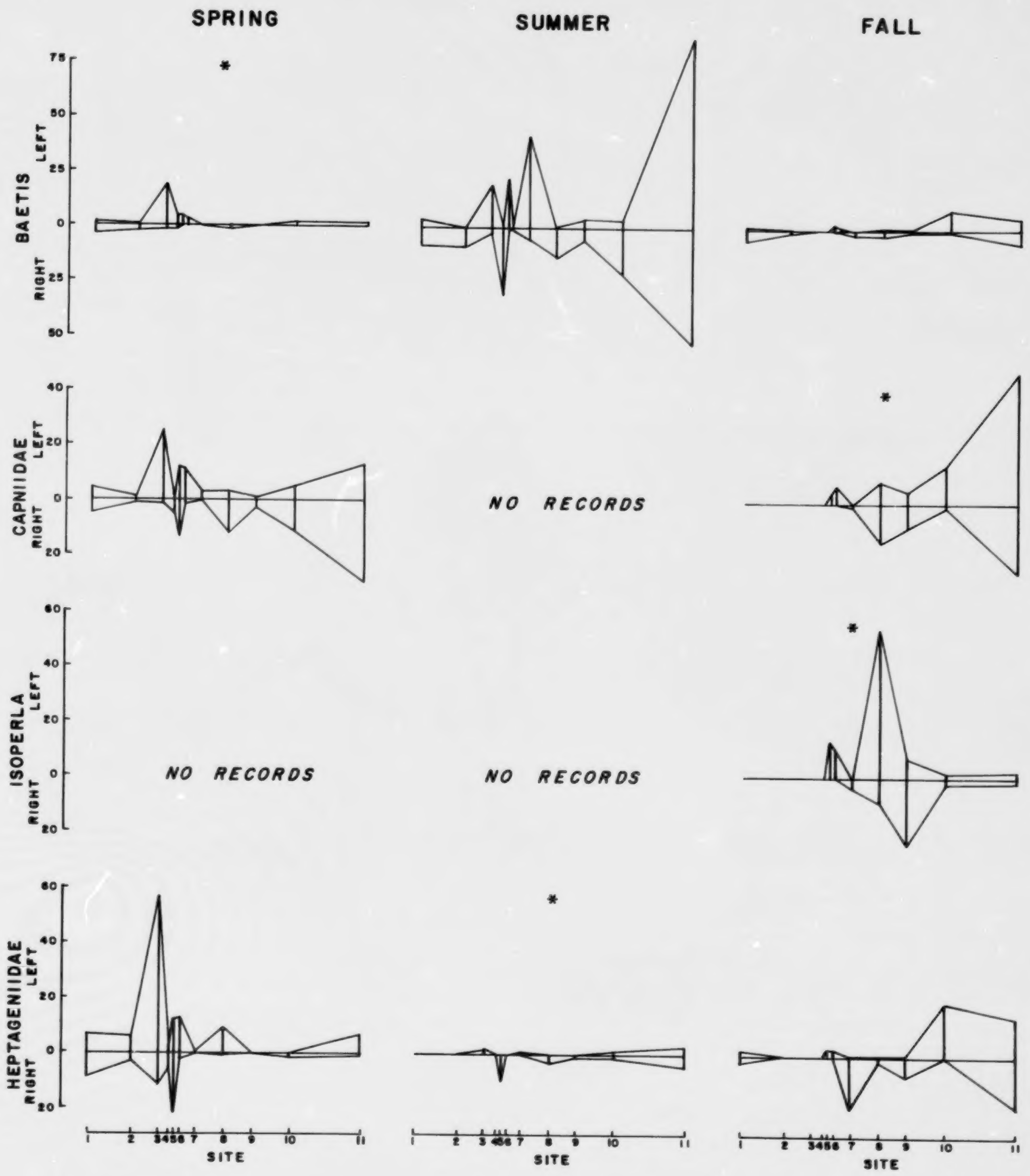
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch



* Indicates the season in which a taxon explains a large fraction of the sample variance .

FIGURE 12 Continued .

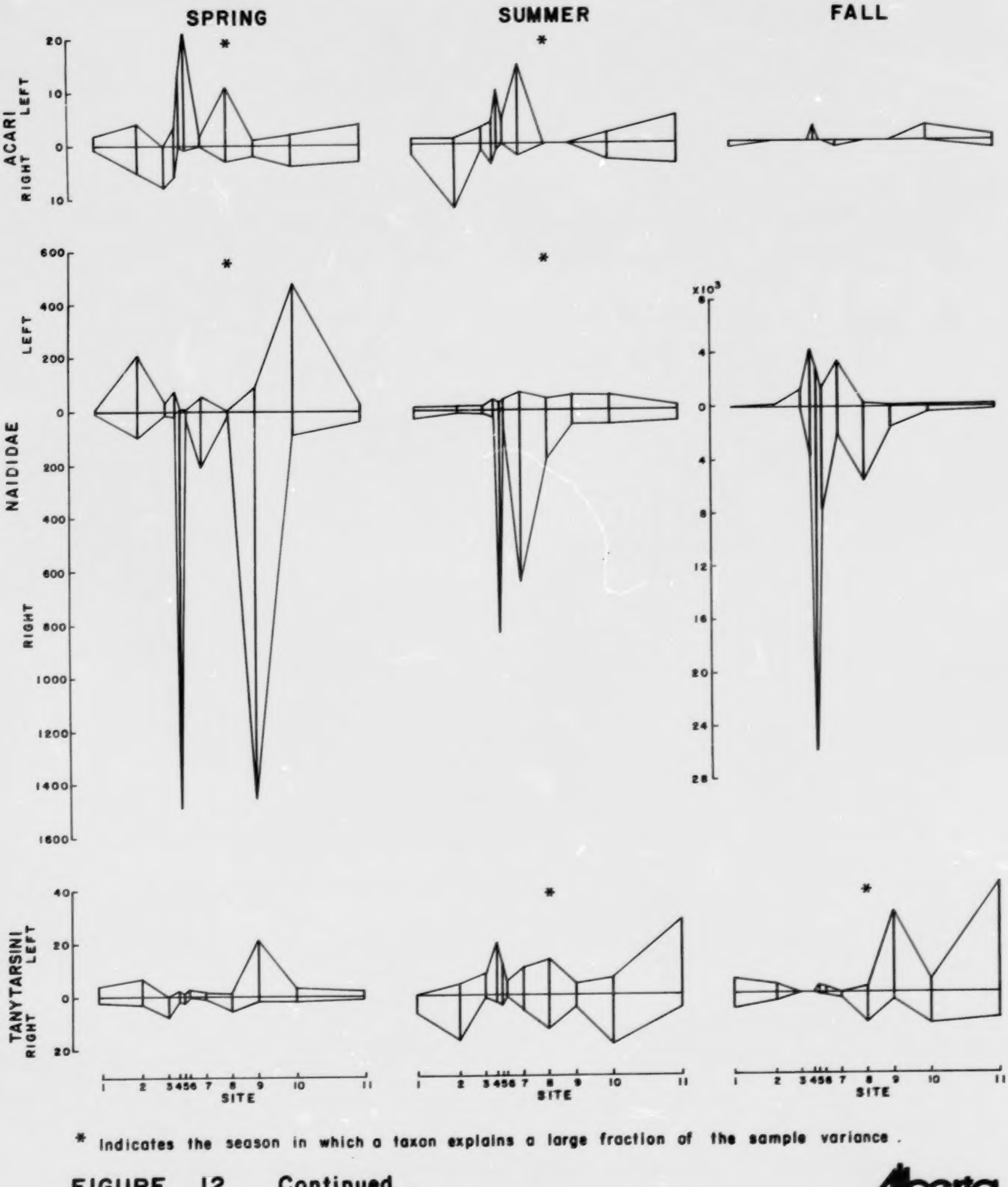
Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch



* Indicates the season in which a taxon explains a large fraction of the sample variance.

FIGURE 12 Continued

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch



* Indicates the season in which a taxon explains a large fraction of the sample variance .

FIGURE 12 Continued .

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

very low numbers in samples from sites upstream of Edmonton, but they showed gradual and definite increases in numbers downstream of the city. The response of these three genera at the sites farthest downstream was inconsistent. Other taxa such as Tanypodinae, Orthocladiinae, Tubificidae, *Heptagenia*, Heptageniidae, Mermithoidea, *Psychomyia*, *Pseudocleon*, *Isoperla*, and Capniidae showed similar trends, but were often rather well represented at upstream sites.

Only two taxa showed a gradual negative response. These were Enchytraeidae, which was selected 3 times by principal component analysis, and *Rhithrogena*, which was selected twice, once in spring and once in fall, by principal component analysis. The upstream densities for these two taxa were low and both taxa occurred occasionally at sites downstream of Edmonton. *Baetis* showed opposite responses in spring and fall: numbers decreased in spring and increased in fall.

Naididae was the only taxon to show a dramatic, short-lived positive response downstream of certain sites. Although naidids were one of the most typical components at certain sites in the fall, they accounted for only a small fraction of the variance in the first three principal components (eigenvector values 0.089, 0.046, and 0.039 in vector 1, 2, and 3, respectively), even though they accounted for a large fraction of the variance in the remaining principal components (e.g., eigenvector values 0.255, 0.117, 0.225, -0.310, 0.363, -0.528, -0.418 in vectors 4 to 10, respectively).

Only unidentified, small Hydropsychidae larvae did not show notable or consistent trends in the river section under study.

3.3.4 Relationships between Results from Cluster Analysis and Principal Component Analysis

Scattergrams obtained by principal component analysis are represented in Figures 9, 10, and 11 for spring, summer, and fall data, respectively.

Hypotheses formulated from the results of one analysis technique gain strength when these results are concordant with the results of another technique. Ideally, site clusters identified by cluster analysis should correspond to sites grouped by principal component analysis projections, and these site groups would have interpretable meanings in the context of the study.

The boundaries of site groups which were identified by cluster analysis in the 3 seasons are indicated on the corresponding principal component analysis projections (Figs. 9b to 11b).

3.3.4.1 Spring

Cluster analysis showed that in spring, sites fell into 3 major groups: clus-1, clus-2, clus-3 (Fig. 9a). Principal component analysis (Fig. 10b) indicated that the separation between clus1 and clus-2 was due mainly to density differences for taxa which were most characteristic for the first vector (Table 7). Sites from clus-2 were characterized by higher numbers of Chironomini, Tubificidae, Mermithoidea, Tanypodinae, Tricorythodes, Psychomyia and Ferrissia, whereas sites from clus-1 were characterized by Baetis, Alloperla, Rhithrogena, and Heptageniidae. The second vector (Table 7) explained differences within each of clus-1 and clus-2, which were due mainly to variations in abundance of Tanytarsini and Ceratopogonidae in one direction, and of *Isoperla*, Chironomid pupae, Tanypodinae, Hydropsychidae, and *Psychomyia* in the other. The third vector (Table 7) explained why the clus-3 right-bank sites at Rundle Footbridge and Sturgeon (typified by a predominance of Naididae, Turbellaria, Chironomidae pupae, and Tubificidae) were different from other sites (typified by Acari, Enchytraeidae, *Glossosoma*, and Nematoda).

3.3.4.2 Summer

Two site groups were differentiated by cluster analysis for the summer data (Fig. 10a). A comparison of cluster analysis and principal component analysis (Fig. 10) did little to clarify relationships among summer data. The separation of sites into only two clusters and the absence of any sub-clustering among sites was unexpected. However, an inspection of the relative locations of sites in the principal component analysis projections revealed that sites were projected in an orderly fashion: sites from the upstream locations were furthest from sites from downstream locations, whereas sites in the centre of the study section had an intermediate position on the principal component analysis projection.

3.3.4.3 Fall

Three major clusters (clus-1, clus-2, and clus-3) were identified in the fall data (Fig. 11a). Principal component analysis showed that the distinction between clus-1a and clus-1b was more important than suggested by cluster analysis alone, because both groups were physically separated by clus-2 on the principal component projections. The first vector separated the three site groups on the basis of density differences for Enchytraeidae on the positive side of the axis (+) and for _Tricorythodes_, _Heptagenia_, and _Isoperla_ on the negative side (-). The first taxon was more typical of upstream sites, whereas the latter three were more characteristic of downstream sites. Enchytraeidae, _Psychomyia_ (+), and Mermithoidea, Capniidae, _Ferrissia_ Orthocladiinae (-), explain most of the variation in the second vector.

It is difficult to visualize the relative position of site groups when a two-dimensional projection is used to represent three-dimensional space, as is the case in Figure 11b. For example, principal component projections in two dimensions showed quite a bit of overlap between clus-1a and clus-2. However, analysis of the third vector indicated that these two clusters were quite different: Enchytraeidae, Chloroperlidae, and _Rhithrogena_ were more typical of clus-1a, and Elmidae, _Caenis_, Tanytarsini, and Tubificidae were more typical of clus-2. The amount of overlap between clus-2 and clus-1b was reduced in a similar way in three-dimensional space. Cluster analysis clearly separated the right-bank site at Rundle Footbridge from all other sites; in two-dimensional space, however, principal component analysis showed little difference between this site and clus-2 sites. Naididae was the most typical faunal element at Rundle

Footbridge in the fall. This taxon had low eigenvector values in the first three vectors, but high eigenvector values in the remaining vectors. Such high values in vectors which explain nearly 50% of sample variance suggested that sites with high naidid numbers (e.g., right-bank site at Rundle Footbridge) are significantly different from sites with low naidids numbers.

3.3.5 One-Way Analysis of Variance (ANOVA)

Principal component analysis showed that there were differences in the taxonomic composition of the invertebrate assemblies in the site clusters which were identified by cluster analysis. However, the separation of these site clusters was also evident at a lower level of identification (e.g., major taxonomic groups) utilizing parameters which summarize information for the entire invertebrate assembly (i.e., total invertebrate density, Shannon-Wiener diversity, and total number of taxonomic groups). The statistical significance of differences between cluster means for these parameters was tested with a one-way ANOVA.

3.3.5.1 Spring

The one-way ANOVA performed on the data from the three site groups identified by multivariate analysis in spring showed that there were significant differences in all parameters tested, except for numbers of Trichoptera and Plecoptera (Table 8). Ephemeroptera (mayfly) numbers were significantly higher in the upstream part of

Table 8. Comparison of means for selected benthic parameters between sites groups defined by cluster analysis and principal component analysis for spring 1982 (summary of ANOVA results)

	Summary of results from one-way ANOVA		Summary of results from Student-Newman-Keuls Test
	F	p	
Nematoda (1)	7.62	0.0008	clus-3 < clus-1 < clus-2
Oligochaeta (1)	116.49	0.0000	clus-1 < clus-2 < clus-3
Ephemeroptera (1)	8.40	0.0004	clus-3 = clus-2 < clus-1
Trichoptera (1)	1.85	0.1623	no significant difference
Plecoptera (1)	0.57	0.5679	no significant difference
Chironomidae (1)	31.92	0.0000	clus-1 < clus-2 = clus-3
Total Numbers (1)	100.27	0.0000	clus-1 < clus-2 < clus-3
Total Number of Taxa	22.48	0.0000	clus-3 < clus-2 < clus-1
Shannon-Wiener Diversity	46.75	0.0000	clus-3 < clus-2 < clus-1

1. Tests performed on Log(x+1) transformed data.

2. $df_1 = 3$, $df_2 = 106$; tabulated F values for df_1 and $df_2 = 120$: $F(0.05) = 2.68$
$F(0.01) = 3.95$
$F(0.001) = 5.79$

3. "x = y": means for groups x and y are not significantly different at 0.050 level
"x < y": mean for group x is significantly lower than mean for group y at the 0.050 level

the study section (clus-1). Oligochaete, chironomid, and total invertebrate numbers increased significantly between upstream sites (clus-1) and downstream sites (clus-2); they were highest for right-bank sites at Rundle and Sturgeon (clus-3). The number of taxonomic groups and the Shannon-Wiener diversity declined in downstream direction and were lowest for sites in clus-3.

3.3.5.2 Summer

Because cluster analysis did not identify meaningful groups, no tests were done on cluster means for selected parameters.

3.3.5.3 Fall

The means for the four site groups identified by cluster analysis and principal component analysis differed significantly for all parameters tested (Table 9).

Total invertebrate numbers and oligochaete numbers followed the same pattern. Numbers increased significantly between upstream clus-1a sites and clus-2 sites immediately downstream of Edmonton and in the Fort Saskatchewan area. Although the means for the downstream clus-1b sites were lower than those for clus-2, they were significantly higher than those for clus-1a. Chironomid numbers showed a similar pattern, except that the means between clus-1b and clus-2 were not significantly different. Clus-3 (right-bank site at Rundle Footbridge) had the highest mean for each of the three parameters tested.

Table 9. Comparison of means for selected benthic parameters between site groups defined by cluster analysis and principal component analysis for fall 1982 (summary of ANOVA results)

	Summary of results from one-way ANOVA		Summary of results from the Student Newman Keuls Test
	F	p	
Nematoda (1)	21.10	0.0000	clus-1a = clus-3 < clus-1b = clus-2
Oligochaeta (1)	163.71	0.0000	clus-1a = clus-1b < clus-2 < clus-3
Ephemeroptera (1)	33.26	0.0000	clus-3 = clus-1a < clus-2 < clus-1b
Trichoptera (1)	15.42	0.0000	clus-3 = clus-1a = clus-2 < clus-1b
Plecoptera (1)	3.95	0.0103	clus-3 = clus-2; clus-1a = clus-2; clus-3 < clus-1a < clus-1b
Chironomidae (1)	38.64	0.0000	clus-1a < clus-2 < clus-1b = clus-3
Total Numbers (1)	249.15	0.0000	clus-1a < clus-1b < clus-2 clus-3
Total Number of Taxa	18.42	0.0000	clus-3 < clus-1a = clus-2 < clus-1b
Shannon-Wiener Diversity	47.61	0.0000	clus-3 < clus-2 < clus-1a = clus-1b

1. Tests performed on Log(x+1) transformed data.

2. $df_1 = 2$, $df_2 = 107$; tabulated F values for df_1 and $df_2 = 120$: $F(0.05) = 3.07$
$F(0.01) = 4.79$
$F(0.001) = 7.32$

3. "x = y": means for groups x and y are not significantly different at 0.050 level
"x < y": mean for group x is significantly lower than mean for group y at the 0.050 level

The parameter means for Plecoptera, Ephemeroptera, and Trichoptera were lowest for clus-3 and highest for clus-1b. However, the differences between means for clus-3 and the remaining site groups were not as great as might have been expected. Ephemeroptera (mayfly) numbers were not significantly different between clus-3 and clus-1a. Caddisfly numbers were not significantly different among clus-1a, clus-2, and clus-3. Although Plecoptera (stonefly) numbers were significantly lower in clus-3 than in clus-1a, the means for each of these two site groups were not significantly different from the mean for clus-2. The number of taxonomic groups was lowest for clus-3 and highest for clus-1b; there was no significant difference between clus-1a and clus-2 cluster means for this parameter. The Shannon-Wiener diversity was lowest for clus-3 and highest for clus-1a and clus-1b; the latter two were not significantly different from each other.

4.0 DISCUSSION

4.1 Community Descriptors

The results of the spring, summer, and fall invertebrate surveys of the North Saskatchewan River in 1982 showed important changes in the benthic invertebrate community in the river between Devon and Pakan Bridge. These changes can be attributed to an alteration of the quality of the water.

The most characteristic features of the changes in community parameters between Devon and Pakan Bridge are listed below:

1) The total invertebrate numbers per unit surface area increased downstream of the city. The highest number of specimens per unit surface area was recorded at the Rundle Footbridge right-bank site.
2) Shannon-Wiener diversity values were highest for the sites farthest upstream and downstream in the study section of the river. The lowest values were determined for the Rundle Footbridge right-bank site.
3) The distribution of numbers among major taxa showed two important changes. Sites upstream of Edmonton were characterized by an even distribution of numbers among taxa. The first change whereby oligochaetes, chironomids, and nematodes became dominant usually occurred between 50th Street Footbridge and Rundle Footbridge. The second change was an increase in mayfly, stonefly and caddisfly numbers which usually occurred between Sturgeon and Vinca Bridge, and

which marked the return to an even distribution of numbers among taxa. The return to an even distribution of numbers among taxa in the downstream part of the study section was interpreted as evidence of "recovery" from the impacts of effluent discharge in the greater Edmonton area.

4) There were slight and frequently inconsistent decreases in numbers of taxonomic groups within the city limits; the lowest value was recorded at Rundle Footbridge.

Although the changes described above were more pronounced for right-bank sites, they are also evident for left-bank sites. Most municipal effluents enter the river on the right bank.

The nature of the changes which occurred in the zoobenthic assemblies of the North Saskatchewan River in 1982 suggested that enrichment was the most significant impact. Enrichment contributes to increases in total numbers of organisms through total food enhancement; it could contribute to reduced diversity through temporary reductions in oxygen levels or through substrate fouling. There was no substantial evidence to indicate that the invertebrate community of the North Saskatchewan River was adversely impacted by the presence of toxic substances in effluents discharged into the river. In some river sections, toxic substances would have produced lower total numbers and even lower diversity, and possibly the total elimination of living organisms.

Temperature and food resources were the two factors most likely to limit the development of invertebrate populations in the

North Saskatchewan River. Although site-to-site temperature differences were neglegible on a given date (see Section 6.0, Part One), enrichment coming from point-source effluents resulted in substantial longitudinal differences in the quantity and quality of available food. On the other hand, seasonal temperature differences in the river were quite large, and these differences may have masked the effects of food abundance, especially at certain times of year.

Populations sampled in spring integrated the effects of winter conditions on the zoobenthos. In the winter, dissolved oxygen levels were adequate (see Section 7.0, Part One of this report), but invertebrate populations were unable to exploit fully the food available at certain sites, because low temperature reduced their metabolism and inhibited their growth and reproductive activity. Consequently, site-to-site differences detected in spring and attributable to the influence of point-source effluents were small.

Higher temperatures from spring through summer resulted in increased growth rates and reproductive activity of true benthic invertebrates. The emergence of adults of semi-aquatic insect species (e.g., Plecoptera, Ephemeroptera, Trichoptera, and Diptera) and their oviposition (egg-laying) represented the start of new generations which often had very high numbers at the outset. Population numbers in fall were largely a function of food availability during summer and fall and, therefore, differences between sites were maximal.

In general, the principal causes of the cultural eutrophication of rivers are effluents from municipal wastewater treatment plants and from industries, followed by runoff from agricultural and urban areas (Hynes 1960). These sources represent the addition of inorganic and organic nutrients to aquatic systems and contribute directly or indirectly to an abundant and renewable food supply for herbivorous and detritivorous organisms. Although increase in the amount of food available is in itself not detrimental, the oxidation of abundant organic material in water through both chemical and biological processes requires a large amount of dissolved oxygen, and this can contribute to the onset of anaerobic conditions in slow moving waters. Some invertebrate taxa have high oxygen requirements (e.g., Plecoptera, Ephemeroptera, and Trichoptera). The larvae of these insects are often designated as "clean water species". In contrast, "dirty water species" is a term used to describe Oligochaeta, Chironomidae and Nematoda, groups which are generally more tolerant of lower oxygen concentrations and which tend to be mainly detritivorous.

Hynes (1960) has described typical cases of severe organic pollution where the entire aquatic community was eliminated because of anaerobic conditions. In situations where only very low levels of oxygen remained in solution, tubificid worms and chironomid larvae were often the only invertebrates present. Hynes also described cases of mild organic pollution which occurred when biological treatment was efficient, or when dilution was great. In such cases, little more than a general increase in invertebrate population density was observed.

The invertebrate data collected in the North Saskatchewan River in 1982 did not resemble cases of severe organic pollution described as textbook examples in the literature. Instead, they were more similar to cases which Hynes cited as illustrative of mild organic contamination. In the North Saskatchewan River in 1982, the relatively high discharge rates and flow regulation (see Section 2.4, Part One) ensured high dilutions. Consequently, satisfactory levels of dissolved oxygen were maintained throughout the year. Flow regulation in the North Saskatchewan River has been cited as a major reason for improved dissolved oxygen conditions in recent years (Alberta Environment 1978, Bouthillier 1983, Paterson and Nursall 1975).

The impact of enrichment on the invertebrate community of the North Saskatchewan River was nonetheless distinct. In the upstream part of the study section, a relationship between changes in invertebrate community structure and point-source effluent discharges was established.

Low total invertebrate numbers, high H' values, and a fairly even distribution of numbers among taxa were features which characterized Devon and E.L. Smith, and were indicative of a virtually unimpacted invertebrate community and good water quality.

E. L. Smith was considered to be an unimpacted site, but the low percentage of clean water taxa (Plecoptera, Ephemeroptera, and Trichoptera) in the Fall suggested a slight perturbation. Although it was possible that these changes were due to human activities (such as the release of chlorinated effluents from the Devon Sewage Treatment Plant), it is more likely that they were caused by the activity of the huge corixid populations described above.

The first signs of enrichment were detected at Rossdale, primarily at the left-bank site. The community response was moderate: numbers were somewhat higher, but H' values remained unaffected; it was only in fall that oligochaete (tubificids and naidids) numbers increased appreciably. The left-bank site at Rossdale was the most upstream site in the study section where extensive filamentous algal growth was observed. The main potential sources of impact between E.L. Smith and Rossdale were storm sewers. The left-bank site at Rossdale was downstream of the Groat Bridge and Quesnell Bridge storm sewers, major sewers which drain the north-west part of the city. However, the possible existence of a number of small combined sewers in this section of the river is under investigation (see Section 2.10, Part One of this report).

Community changes were more apparent at the 50th Street Footbridge left-bank and right-bank sites, particularly in the fall. Higher total densities, a drop in diversity, and the dominance of oligochaetes distinguished these sites from upstream sites. Differences in invertebrate fauna composition between Rossdale and 50th Street were attributed to the influence of a number of major combined sewers in this part of the study section of the river. Combined sewers convey domestic sewage and surface runoff to the Gold Bar Wastewater Treatment Plant. During heavy rainfalls in 1982, the combined sewer system became overloaded and some raw sewage and surface runoff entered the North Saskatchewan River. These discharges were apparently more important in summer and fall than in winter or spring. Consequently, the impact from combined sewers on invertebrates was more evident in the fall sample set than in the spring sample set.

Because runoff episodes occur many times in most years, more or less permanent habitat alterations can be expected which, in turn, induce structural and functional changes in the benthic community. Urban runoff varies in its effect on aquatic biota, depending on its chemical and physical composition. At the Rossdale left-bank site and at both 50th Street sites, the effect of urban runoff was enrichment. It promoted the growth of filamentous algae and encouraged the development of a denser invertebrate community. Similar effects due to this type of enrichment have been documented elsewhere. For example, Pratt et al. (1981) reported that the Greenfield urban runoff into the Green River (Massachusetts) resulted in a decrease in community diversity and a change in the taxonomic structure of the community, from one dominated by pollution (enrichment) sensitive forms to one dominated by pollution (enrichment) tolerant forms.

Although combined sewer effluents had a discernible influence on the water quality of the North Saskatchewan River, as evidenced by changes in the invertebrate community, it was downstream of the Gold Bar Wastewater Treatment Plant that the greatest changes in the invertebrate community occurred. The site most affected by the discharge from this plant was the right-bank site at Rundle Footbridge which was located immediately downstream of the plant outfall. The most remarkable change in the community at this site was the dramatic increase in oligochaete numbers, particularly for the family Naididae. With few exceptions, naidids feed on bacteria, detritus, and algae (Learner *et al*. 1978), and the main factors determining their distribution and abundance are the nature of the substrate, the presence and kind of vegetation, and the availability of oxygen. The response of naidids may vary with the types of pollutants entering a river. In general, however, the organic enrichment of rivers with stony substrates results in considerable naidid population increases. The high numbers of naidids (27,000 individuals per sample) recorded for the right-bank site at Rundle Footbridge were similar to those reported by Szczesny (1974) for a population of *Nais elinguis* in the Polish river Kryniczanka downstream of a sewage outfall. *Nais cummunis*/*variabilis*, and *Chaetogaster diaphanus* are also often observed in association with organic enrichment (Learner 1979). These two species, together with *N. elinguis*, dominated the naidid species association at the Rundle Footbridge right-bank site. There is little doubt that the high naidid numbers in the well aerated gravel riffles at Rundle Footbridge were induced by enrichment from the Gold Bar Wastewater Treatment Plant effluent.

Naidids are an important food source for predatory members of the benthic community (Learner *et al*. 1978) and represent an important pathway for energy transfer to higher trophic levels. Although naidids may be common in natural habitats, they are often also found in large numbers in sewage filter beds where they are believed to play a considerable role in the process of sewage breakdown (Learner 1979). It is quite possible that huge naidid populations like those which occurred downstream of the Gold Bar Wastewater Treatment Plant contributed greatly to the purification of the river water.

The magnitude of the naidid population at the Rundle Footbridge right-bank site resulted in a strongly skewed distribution of numbers among taxa and low diversity values. Marked declines in numbers of other taxonomic groups were only noted in the fall at this site. In spring and summer, thriving populations of mayflies, stoneflies, and caddisflies maintained fairly high numbers. This suggests that there was more stress on the invertebrate community in late summer and fall than at other times of the year. Higher water temperatures at that time probably intensified the impact of point-source effluents entering the river by contributing to higher metabolic rates and lower dissolved oxygen levels. Adverse effects on the invertebrate community would have been increased when primary treated sewage effluent was diverted into the river from the Gold Bar Wastewater Treatment Plant during rain-induced peak flows in the summer. The bypass of the secondary treatment process occurred on 32 days from June to October, 1982, 25 of these being in the months of July and August.

No differences in the invertebrate fauna were measured between the Rundle Footbridge left-bank site and the 50th Street Footbridge left-bank site. There were no additional point-source discharges between the two sites on this bank.

Spring and summer data from the right-bank site at Beverly Bridge were unexpected in the light of previously collected information for this location (Alberta Environment, unpublished data). The fauna showed little response to organic enrichment in 1982. Total numbers were much lower than at the Rundle Footbridge right-bank site, although the percentage of enrichment-tolerant taxa was high. As noted in Part One of this report (Section 3.0), lateral mixing in the North Saskatchewan River is poor; effluent plumes persist over relatively long distances, and the channels followed by these plumes change according to river discharge volumes. The Gold Bar Wastewater Treatment Plant effluent plume was probably confined to the central part of the river at Beverly Bridge during and prior to the spring and summer sampling in 1982 and thus had little influence on the site where invertebrates were sampled, as there were extensive shallows near the right bank at this location.

The changes which occurred in the community further downstream of Edmonton were neither as remarkable nor as consistent as those observed at the Rundle Footbridge right-bank site. The overall fauna composition changed little for sites from Clover Bar to Sturgeon. However, the population density for most taxonomic groups increased in downstream direction. Taxa most representative of this tendency were the mayflies *Tricorythodes*, *Heptagenia*, and unidentified Heptageniidae, the caddisflies *Psychomyia*, *Cheumatopsyche*, *Hydropsyche*, and unidentified Hydropsychidae, the stoneflies *Isoperla* and *Alloperla*, and the mollusk *Ferrissia*. These taxa commonly occur in fairly eutrophic environments. Their food consists mainly of fine particulate organic matter (Merritt and Cummins 1979) and they are known to have relatively wide tolerances to a variety of chemicals. For example, Roback (1962) reported the occurrence of Hydropsychidae in waters with wide ranges in pH, turbidity, hardness, chloride, oxygen and nutrient concentration; Wiggins (1977) considered *Cheumatopsyche* to be a genus tolerant of organic enrichment. Therefore, the consistent pattern of population increase among invertebrates downstream of Edmonton is primarily a response to organic enrichment.

The zoobenthic data collected in 1982 were not indicative of concentrations of toxic substances coming from municipal or industrial effluents. This study was not designed to identify specific or localized impacts from individual effluents to the river, but rather to characterize the integrated impact on water quality of all effluents to a section of the river. It is likely that municipal and industrial discharges downstream of Edmonton delay "recovery" of the fauna in the North Saskatchewan River by contributing additional enrichment. As discussed earlier, recovery implies the return to a community structure comparable to that of the unimpacted river.

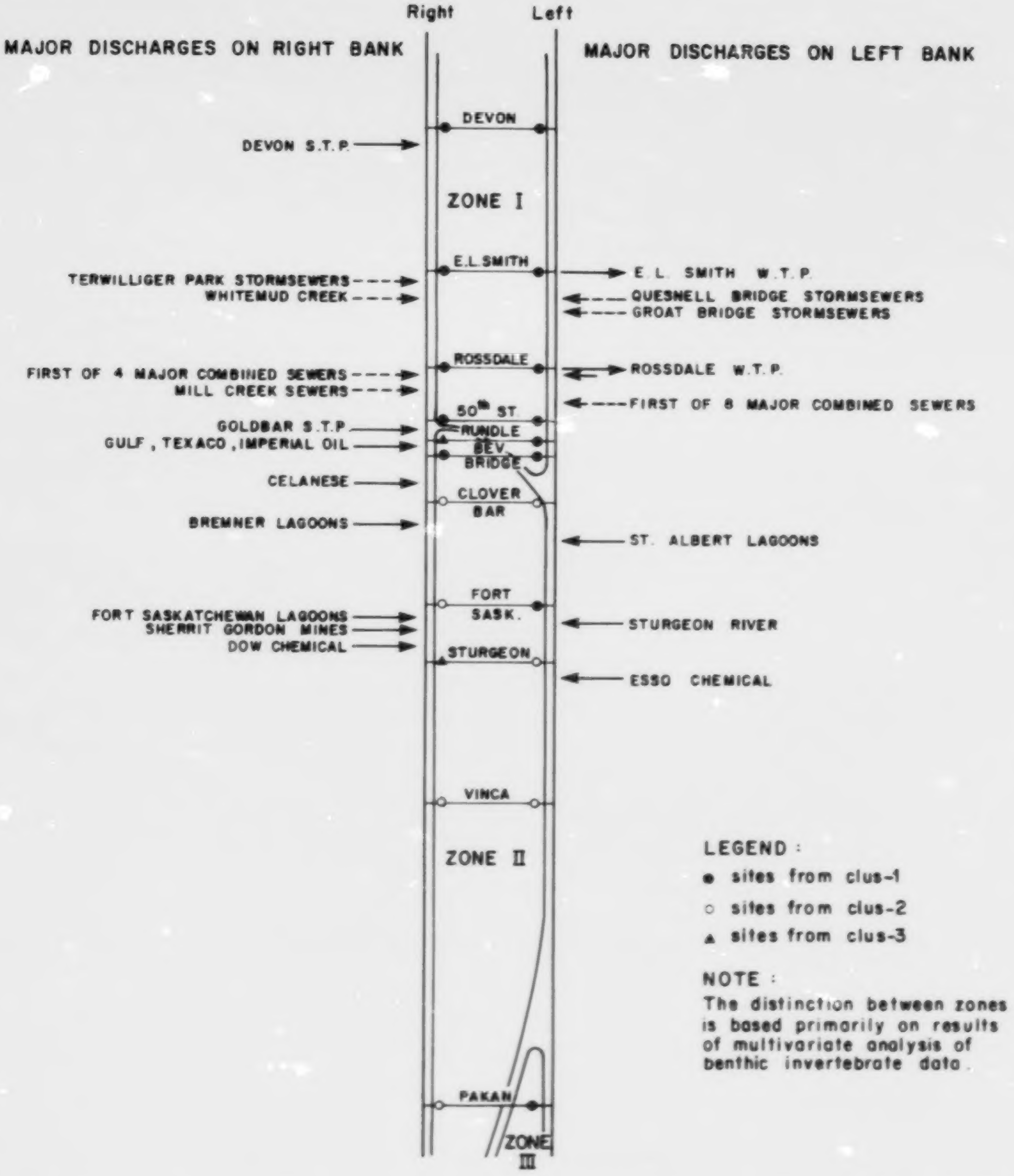
The invertebrate communities at Vinca Bridge and Pakan Bridge, the two locations furthest downstream in the study section of the river, showed consistent signs of recovery. The distribution of numbers among major taxa and the values for the Shannon-Wiener diversity index were comparable to those observed at Devon. However, total numbers were much higher. The invertebrate community characteristics indicated that the river water at Pakan Bridge had regained a level of quality satisfactory to the requirements of a diversity of invertebrates, but they also showed clearly that the river at Pakan Bridge was much more eutrophic than at Devon.

4.2 Multivariate Analyses

Spring and Fall

Figures 13 and 14 synthesize the information provided by the multivariate analyses of invertebrate spring and fall data. The three zones which are shown in these figures correspond to the site groups identified by cluster analysis and principal component analyses.

Zone I groups sites which were unaffected by major point-source effluents and which had unimpacted benthic invertebrate communities. This zone extended further downstream in the spring than in the fall. Sites which belonged to Zone I in the spring but not in the fall were downstream of major storm and combined sewer outfalls. The quality of spring runoff (ice melt) may have been different from that of summer runoff (rain) and the effects of spring runoff neither


Right
Left
MAJOR DISCHARGES ON RIGHT BANK
MAJOR DISCHARGES ON LEFT BANK
DEVON
DEVON S.T.P.
ZONE I
E.L.SMITH
E.L. SMITH W.T.P.
TERWILLIGER PARK STORMSEWERS
WHITEMUD CREEK
QUESNELL BRIDGE STORMSEWERS
GROAT BRIDGE STORMSEWERS
ROSSDALE
ROSSDALE W.T.P.
FIRST OF 4 MAJOR COMBINED SEWERS
MILL CREEK SEWERS
FIRST OF 8 MAJOR COMBINED SEWERS
50th ST.
GOLDBAR S.T.P.
RUNDLE
GULF, TEXACO, IMPERIAL OIL
BEV. BRIDGE
CELANESE
CLOVER BAR
BREMNER LAGOONS
ST. ALBERT LAGOONS
FORT SASK.
FORT SASKATCHEWAN LAGOONS
SHERRIT GORDON MINES
DOW CHEMICAL
STURGEON RIVER
STURGEON
ESSO CHEMICAL
VINCA
ZONE II
PAKAN
ZONE III

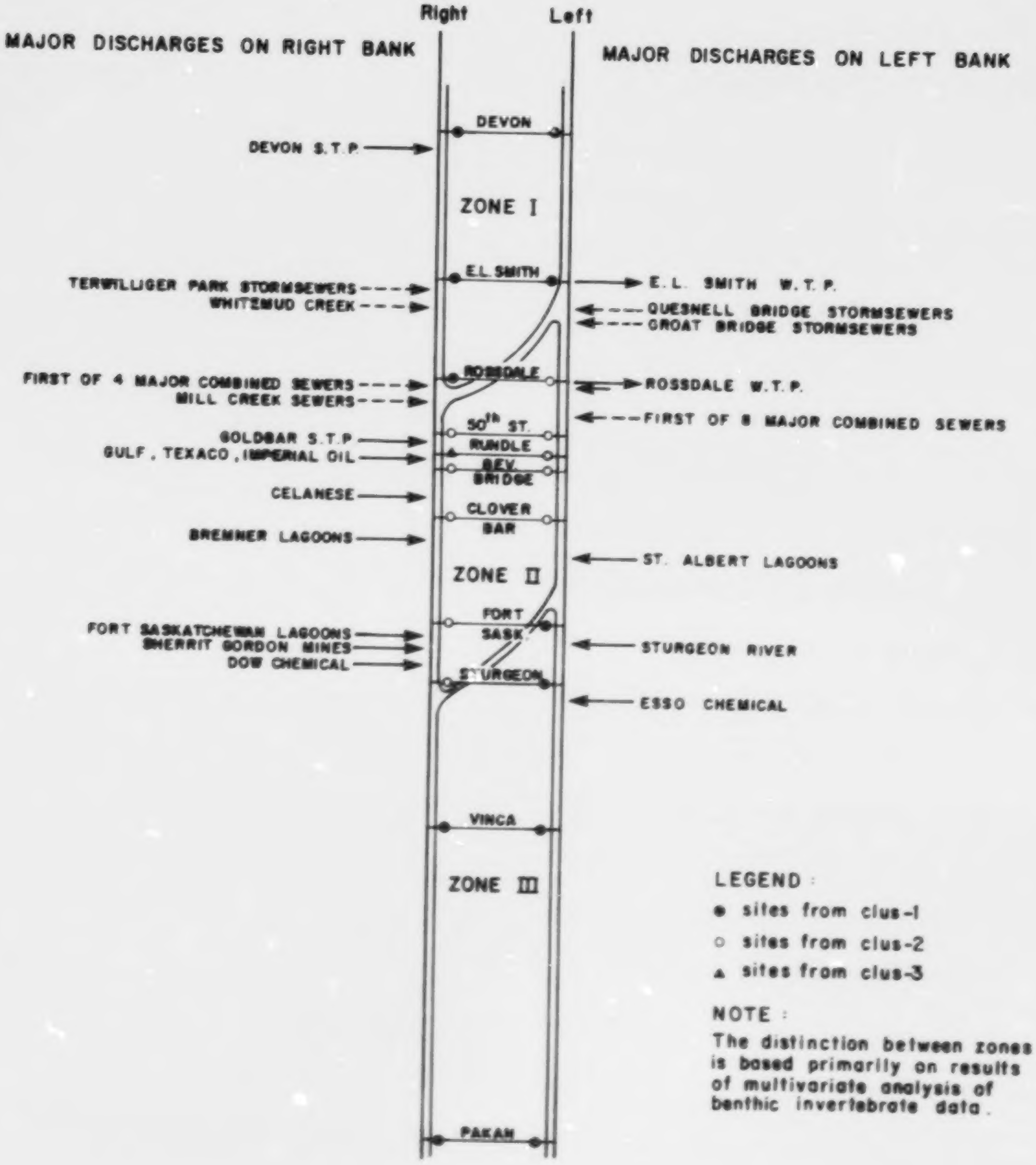
LEGEND:

- ● sites from clus-1
- ○ sites from clus-2
- ▲ sites from clus-3

NOTE:
The distinction between zones is based primarily on results of multivariate analysis of benthic invertebrate data.

FIGURE 13. SPRING 1982: SCHEMATIC PRESENTATION OF ZONES OF DIFFERENT WATER QUALITY IN THE NORTH SASKATCHEWAN RIVER

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch


Right
Left
MAJOR DISCHARGES ON RIGHT BANK
MAJOR DISCHARGES ON LEFT BANK
DEVON
DEVON S.T.P.
ZONE I
E.L. SMITH
TERWILLIGER PARK STORMSEWERS
WHITEMUD CREEK
E.L. SMITH W.T.P.
QUESNELL BRIDGE STORMSEWERS
GROAT BRIDGE STORMSEWERS
ROSSDALE
FIRST OF 4 MAJOR COMBINED SEWERS
MILL CREEK SEWERS
ROSSDALE W.T.P.
50th ST.
FIRST OF 8 MAJOR COMBINED SEWERS
GOLDBAR S.T.P.
RUNDLE
GULF, TEXACO, IMPERIAL OIL
BEV. BRIDGE
CELANESE
CLOVER BAR
BREMNER LAGOONS
ZONE II
ST. ALBERT LAGOONS
FORT SASK.
FORT SASKATCHEWAN LAGOONS
SHERRIT GORDON MINES
DOW CHEMICAL
STURGEON RIVER
STURGEON
ESSO CHEMICAL
VINCA
ZONE III
PAKAN

LEGEND :

- ● sites from clus-1
- ○ sites from clus-2
- ▲ sites from clus-3

NOTE :

The distinction between zones is based primarily on results of multivariate analysis of benthic invertebrate data.

FIGURE 14. FALL 1982 : SCHEMATIC PRESENTATION OF ZONES OF DIFFERENT WATER QUALITY IN THE NORTH SASKATCHEWAN RIVER

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

as persistent nor as perceptible as those of summer runoff. Mention was made earlier of the greater impact of combined sewers in the fall than in the spring. This was verified by cluster analysis and principal component analysis, which grouped sites affected by major combined sewers with other impacted sites in fall, but not in spring.

Zone II groups sites which were downstream of major municipal and industrial facilities. The invertebrate community clearly showed signs of impact at all of these sites. Multivariate analysis verified that two sites, Rundle Footbridge right-bank in both seasons and Sturgeon right-bank in spring only, had very different invertebrate communities and were more severely impacted than other sites. In spring, Zone II included two sites, Beverly Bridge right-bank and Fort Saskatchewan left-bank, which were grouped within Zone I sites according to cluster analyses. However, sampling problems, due to main channel shift at Beverly Bridge and to the influence of variable mixing patterns at Fort Saskatchewan, were suspected and these two sites probably belong in Zone II. Impacts from point-source effluents extended further downstream in the spring than in the fall. The reasons for this are discussed in greater detail below.

Zone III represents a recovery zone. The invertebrate communities at these sites showed many similarities to those of Zone I, the most important difference being the higher invertebrate densities at sites in Zone III. As a reflection of the remnant effects of winter conditions, the recovery zone began further downstream in the spring than in the fall. The reasons for this will also be discussed below.

Summer

Summer samples were collected about one month after the spring peak discharges, which were exceptionally high in 1982. This event must have been a major source of disturbance to the invertebrates. Waters (1972) has shown that changes in flow rates result in changes in drift rates. Taxa respond differently to this type of short-term disturbance; some are eliminated entirely, whereas others persist (Patrick 1970). Organisms which are washed from one area may become temporary or permanent residents of an area downstream, while they are themselves replaced by other organisms drifting from upstream. In this way, seasonal peak flows or floods can have a "homogenizing" effect on benthic invertebrate composition. Crossman _et_ _al_. (1974) came to a similar conclusion in their study of the Clench River in Virginia, where only minor site-to-site differences were detected after a flood event. Prior to the flood, however, a distinct clustering of sites, based on the taxonomic composition of the zoobenthos, could be related to the impact of point-source discharges. These authors concluded that floods have a homogenizing effect on the benthic invertebrate community. The situation in the North Saskatchewan River in 1982 was comparable, because no site clustering occurred after the late-spring peak discharges, even though there were definite patterns in the spring and fall data. As in the Clench River study, a marked increase in flow rates may have induced a more uniform summer distribution of invertebrates among sites. The Sturgeon left-bank site was distinctly different from all other sites at this time (see Fig. 10), but this difference was probably due more to substrate differences at this site or to drift from the Sturgeon River, than to water quality differences in the North Saskatchewan River.

4.3 Indications of a Seasonal Pattern in the Water Quality of the North Saskatchewan River

Despite the similarities between Figures 13 and 14, there were important differences in the zones which were indicative of water quality in the North Saskatchewan River in the spring and fall of 1982. Some of these differences (e.g., inclusion or exclusion of sites located below storm and combined sewers in Zone I) can be explained by qualitative differences in effluents discharged into the river. Other differences, such as the lengths of the impacted and recovery zones (Zone II and Zone III, respectively) in spring and fall, have causes other than effluent quality.

Most biological and chemical processes proceed more rapidly at high temperatures than at low temperatures. Therefore, in a well oxygenated river, biological and chemical degradation will be more efficient during the warm period of the year than in winter and early spring. Consequently, Zone II should be longer in the winter than in the summer. This alone could explain the difference in the length of Zone II in spring and in fall; spring invertebrate data were a cumulative reflection of water quality conditions during winter and early spring, whereas fall invertebrate data were a cumulative reflection of summer and early fall conditions. However, it is likely that river discharge had a strong influence on zone boundaries.

Except for the local runoff in spring, flows are usually low and steady in winter and early spring in the North Saskatchewan River. Late spring and early summer flow rates are usually higher and variable because of mountain runoff and storm events. If both phenomena coincide, as was the case in 1982, discharges can increase dramatically.

High discharges have a homogenizing effect on benthic invertebrate distribution and have a "flushing" or "cleansing" effect on the river as a whole. In terms of late-spring/early summer flushing effects, the fall picture can be thought of as the cumulative effect of 3 or 4 months of near optimal temperature and flow conditions. The spring picture can be considered to represent the cumulative effect of varying temperature and flow conditions over most of the year.

The river zone patterns for spring and fall may be regarded as indicative of a cyclic and dynamic phenomenon whereby the river is cleansed annually and is "soiled" gradually during the rest of the year by discharges from urban areas. The extent of the most impacted zone may vary from year to year and during the course of the year as a result of changes in flow rates, water temperatures, and overall effluent quality and quantity.

5.0 CONCLUSIONS

a) There were clear patterns of change in the benthic invertebrate associations of the North Saskatchewan River in 1982 between Devon and Pakan Bridges; these changes conformed with certain variations in water quality, particularly nutrient and organic enrichment.

b) The invertebrate responses downstream were typical of enrichment. Invertebrate populations responded to greater food availability by increasing in density. This was particularly evident in taxa such as Chironomidae, Nematoda, and Oligochaeta, which are tolerant of environmental stress. Lower Shannon-Wiener diversity values reflected changes in community composition.

c) The first indications of major density and compositional changes occurred in the section of the river which passes through the Edmonton urban area; they were more pronounced at right-bank sites, where the majority of point-source effluents enter the river.

d) The magnitude and nature of the effects of effluents entering downstream of the Fort Saskatchewan location were more difficult to determine because they were masked by the remnant effects of upstream effluents.

e) Stormsewer effluents were the first to have an enrichment effect on the river. However, their impact on the invertebrate community occurred only in the fall, not in spring. This suggested that surface runoff in spring (snowmelt) had a different quality than that in summer and fall (rain).

f) The effects of combined sewers, which discharged surface runoff and raw sewage to the river during periods of heavy rainfall, impacted the invertebrate community only in fall, not in spring.

g) The Gold Bar Wastewater Treatment Plant effluent was a continuous and major food source for invertebrates; it had the most consistent and demonstrable effect on invertebrates. The influence of the Gold Bar Wastewater Treatment Plant was evident a considerable distance downstream of the Edmonton city limits and it overshadowed the impacts of other effluents.

h) The fact that benthic invertebrates of nearly all taxa increased in numbers downstream of Edmonton indicated that industries in the Edmonton and Fort Saskatchewan area did not have an overall toxic impact on invertebrates but, instead, contributed to the eutrophication of the river.

i) The sites sampled comprised three main site groups which corresponded to three zones of water quality: an unimpacted zone upstream of Edmonton, an impacted zone downstream of effluents, and a recovery zone. The invertebrate associations in the recovery zone were rather similar to those in the unimpacted zone; however, the much higher numbers in the recovery zone indicated that the river was more eutrophic downstream of Edmonton. These zones were distinguished by cluster and principal component analyses.

j) Benthic invertebrate data indicated the existence of a cyclic and dynamic pattern of water quality in the river. The relative length of the impacted zone and of the recovery zone would be determined not only by effluent quality and quantity, but also by biological and chemical degradation processes and flow rates. The length of the impacted zone would be shortest during the summer, following the flushing effect of spring peak discharges and a period of optimum conditions for degradation processes. As water temperatures drop in the fall and flow rates decrease, the impacted zone extends gradually further downstream to become longest in the winter.

k) Although the zoobenthos alone does not present a conclusive argument for the judging of water quality, seasonal and spatial patterns were clear and statistically significant. They identify times and locations where physical and chemical studies should be concentrated.

6.0 LITERATURE CITED

Alberta Environment. 1977. Surface Water Quality Objectives. Alberta Environment, Standards and Approvals Division and Pollution Control Division, Water Quality Control Branch, Edmonton. 17 p.

Alberta Environment. 1978. Edmonton Regional Utility Study. Vol. III. Surface Water. Pollution Control Division, Municipal Engineering Branch.

Armitage, P.D., D. Moss, J.F. Wright and M.F. Furse. 1983. The performance of a new biological water quality score system based on macroinvertebrates over a wide range of unpolluted running water sites. Water Research 17 (3): 333-347.

Bouthillier, P.H. 1983. A history of stream pollution assessment and control - North Saskatchewan River 1950's to 1980's. Prepared for Pollution Control Division, Alberta Environment. 58 p.

Bauman, R.W., A.R. Gaufin and R.F. Surdick. 1977. The Stoneflies (Plecoptera) of the Rocky Mountains. Memoirs of the American Entomological Society. 31, 208 p.

Cairns, J. Jr., D.W. Albough, F. Busey and M.D. Chanay. 1968. The sequential comparison index. A simplified method for non-biologists to estimate relative differences in biological diversity in stream pollution studies. J. Wat. Pol. Control Fed. 40:1607-1613.

Cairns, J. Jr., and K.L. Dickson, eds. 1973. Biological methods for the assessment of water quality. ASTM STP 528, American Society for Testing and Materials. 256 p.

Chutter, F.M. 1972. An empirical biotic index of quality of water in South African streams and rivers. Water Research 6:19-30.

Clarke, A.H. 1973. The freshwater mollusks of the Canadian Interior basin. Malacologia 13(1-2): 1-509.

Cook, S.E.K. 1976. Quest for an index of community structure sensitive to water pollution. Environ. Pollut. 11:269-288.

Crossman, J.S., R.L. Kaesler, J. Cairns Jr., 1974. The use of cluster analysis in the assessment of spills of hazardous materials. Am.Midl.Nat. 92:94-114.

Cummins, K.M. 1962. An evaluation of some techniques for the collection and analysis of benthic samples with special emphasis on lotic waters. Am.Midl.Nat. 67 (2): 477-504.

Edmunds, G.F. Jr., S.L. Jensen, and L. Berner. 1976. The Mayflies of North and Central America. Univ. Minnesota Press, Minneapolis. 330 p.

Elliott, J.M. 1977. Some methods for the statistical analysis of samples of benthic invertebrates. Freshw. Biol. Assoc. Sci. publ. No. 25. Second Edition. 160 pp.

Gauch, H.G. and R.H. Whittaker. 1972. Comparison of ordination techniques. Ecology 60:108-118.

Green, R.H. 1979. Sampling design and statistical methods for environmental biologists. John Wiley and Sons. New York. Toronto 257 pp.

Godfrey, P.J. 1978. Diversity as a measure of benthic macroinvertebrate response to water pollution. Hydrobiologia. 57(2):11-122.

Harrel, R.G. and T.C. Doris. 1968. Stream order, morphometry, physico-chemical conditions and community structure of benthic macroinvertebrates in an intermittent stream system. Am.Midl.Nat. 80:220-251.

Hellawell, J.L. 1977. Change in natural and managed ecosystems: detection, measurement and assessment. Proc. R. Soc. Lond. 197:31-57.

Hilsenhoff, W.L. 1977. Use of arthropoda to evaluate water quality of streams. Technical Bulletin No. 100 Department of Natural Resources. 15p.

Hughes, B.D. 1978. The influence of factors other than pollution on the value of Shannon's diversity index for benthic macro-invertebrates in streams. Water Research 1259-364.

Hull, C.H. and N.H. Nie. 1981. Spss. Update 7-9, New procedures and facilities for releases 7-9. McGraw-Hill, New York, Montreal. 402 p.

Hynes, H.B.N. 1960. The biology of polluted waters. Liverpool University Press. 202p.

Hynes, H.B.N. 1972. The ecology of running waters. University of Toronto Press. 555 p.

Kellerhals, R., C.R. Neill and D.I. Bray. 1972. Hydrolic and geomorphic characteristics of rivers in Alberta. Research Council of Alberta. River Engineering and Surface Hydrology Report 71-1. 52 p.

King, D.L. and R.C. Ball. 1964. A quantitative biological measure of stream pollution. J. Wat.Poll.Control Fed. 36:650-653.

Learner, M.A. 1979. The distribution and ecology of Naididae (Oligochaeta) which inhabit the filter beds of sewage-works in Britain. Water Research 13:1291-1299.

Learner, M.A., G. Lochhead and B.D. Hughes. 1978. A review of the biology of British Naididae (Oligochaeta) with emphasis on the lotic environment. Freshwater Biology 8:357-375.

Mason, W.T. and P.P. Yevich. 1967. The use of phloxine B and Rose Bengal stains to facilitate sorting of benthic samples. Trans. Amer. Microsc. Soc. 86(2):221-223.

McClure, M.S. 1974. Aspects of urban runoff from the Edmonton area and its effects on the North Saskatchewan River. Ms Thesis, Univ. of Alberta, Edmonton.

Merritt, R.S. and K.W. Cummins. 1979. An introduction to the aquatic insects. Kendall/Hunt Publishing Company, Dubuque, Iowa. 441 p.

Mudry, D.R. and H.P. Arai. 1973. The life cycle of Hunterella nodulosa Mackiewiz and McCrae, 1962 (Cestoidea: Caryophillidae) Can. J. Zool. 51:781-786.

Murphy, P.M. 1978. The temporal variability in biotic indices. Environ. Pollut. 17:227-236.

Nie, N.H., C.H. Hull of G. Jenkins, K. Steinbremner, D.H. Bent. 1975. Spss. Statistical package for the social sciences. 2nd ed. McGraw-Hill, New York, Montreal. 675 p.

Neill, R.M. 1938. The food and feeding of brown trout (Salmo trutta L.) in relation to the organic environment. Trans. R. Soc. Edinb. 59:481-520.

Paterson, C.G. and J.N. Nursall. 1975. The effects of domestic and industrial effluents on a large turbulent river. Water Research 9:425-435.

Patrick, R. 1970. Benthic communities. Amer. Sci., 5:546-549.

Pennak, R.W. 1953. Freshwater Invertebrates of the United States. Ronald Press, N.Y. 769 p.

Pratt, J.M., R.A. Cooler, and P.J. Godfrey. 1981. Ecological effects of urban stormwater runoff on benthic macro-invertebrates inhabiting the Green River, Massachusetts. Hydrobiologia. 83:29-42.

Reynoldson, T.B. 1982. Impact of Waste Discharge from the City of Edmonton Water Treatment Plants on Biological Water Quality of the North Saskatchewan River. Water Quality Control Branch, Pollution Control Division, Alberta Environment. 3 p.

Reynoldson, T.B. and S. Livingstone. 1983. Effects of Spring Runoff on the North Saskatchewan River in the City of Edmonton. Water Quality Control Branch, Pollution Control Division, Alberta Environment. 26 p.

Roback, S.S. 1962. Environmental requirements of Trichoptera. In: Biol. Prob. Wat. Poll. U.S. Dept. Health and Welfare. 3rd seminar 118-126.

Rooke, J.B. and G.L. Mackie. 1982. An ecological analysis of lotic environments: I. Design and testing. J. Freshw. Ecology 1(4) :421-431.

Rooke, J.B. and G.L. Mackie. 1982. An ecological analysis of lotic environments: II. Comparison to existing indices. J. Freshw. Ecology. 1(4):433-442.

Shannon, C.E. and W. Wiener. 1949. The mathematical theory of communication. University of Illinois Press, Urbana, U.S.A.

Sinha, R.N. 1977. Uses of multivariate methods in the study of stored-grain ecosystem. Entomological Society of America 6(2):185-192.

Simpson, E.H. 1949. Measurement of Diversity. Nature, 163:688.

Siegel, S. 1956. Non-parametric statistics for the behavioural sciences. McGraw-Hill, New York, Toronto, London - 312 pp.

Sokal, R.R. and E.J. Rohlf. 1969. Biometry, the principles and practice of statistics in biological research. W.H. Freeman and Company. San Francisco. 776 pp.

Sprules, W.G. 1977. Crustacean Zooplankton Communities as indicators of Limnological conditions: an approach using principle component analysis. J. Fish. Res. Board Can. 84:962-975.

Sutcliffe, D.W. 1979. Some notes to authors on the presentation of accurate and precise measurements in quantitative studies. Freshwater Biology 9:397-402.

Szczesny, B. 1974. The effect of sewage from the Town of Krynica on the benthic invertebrate communities of the Kryniczanka stream. Acta Hydrobiol. 16:1-29.

Usinger, R.L. (ed.). 1956. Aquatic Insects of California. Univ. Calif. Press, Berkeley. 508 p.

Ward, J.H. 1963. J. Amer. Stat. Assoc. 8:236.

Waters, T.F. 1972. The drift of stream insects. Annual Review of Entomology. 17:253-323.

Wiggins, G.B. 1977. Larvae of the North American Caddisfly Genera (Trichoptera). Univ. Toronto Press, Toronto. 401 p.

Wilhm, J. 1970. Range of diversity index in benthic macroinvertebrate populations. J. Water Pollut. Control Fed. 42:221-224.

Winner, J.M. 1975. Zooplankton. In: River Ecology. P155-169 Whitton, B.A. (ed). University of California Press. Berkeley and Los Angeles. 725 p.

Wishart, D. 1978. Clustan user manual. Third edition. Inter University/Research Council Series Report No. 47. 175 p.

APPENDIX

APPENDIX I: Scientific names of benthic invertebrates and their common equivalents frequently used in this report.

APPENDIX I. Scientific names of benthic invertebrates and their common equivalent(s) frequently used in this report.

Scientific Names	Common Names
	'coelenterates'
Coelenterata	sac animals, such as hydras
	'crustaceans'
Amphipoda	scuds, sometimes "freshwater shrimps"
Arachnida (Acari and Aranea)	spiderlike animals (mites and spiders)
	'worms'
Turbellaria	flatworms
Hirudinea	leeches, "blood suckers"
Oligochaeta	bristle worms
Nematoda	round worms
	'insects'
Diptera	two-winged flies such as midges, mosquitoes
	no-see-ums, black-, deer-, horse-, and crane-flies
Lepidoptera	butterflies, moths
Odonata	dragonflies and damselflies
Collembola	springtails
Ephemeroptera	mayflies
Trichoptera	caddisflies
Plecoptera	stoneflies
Corixidae	water-boatmen
Coleoptera	beetles
	'mollusks'
Mollusca	clams and snails

Volume

3

CA2ALEN18
86N57
Pt3 c.v

North Saskatchewan River

Characterization of Water Quality in the Vicinity of Edmonton (1982-83)

Part III

G'SLATURE LIBRARY
SEP 1 6 [illegible]

Alberta

ENVIRONMENT
Environmental Protection Services
Pollution Control Division
Water Quality Control Branch

NORTH SASKATCHEWAN RIVER:
CHARACTERIZATION OF WATER QUALITY IN THE VICINITY OF EDMONTON (1982-1983)

PART III

COMPENDIUM OF DATA FOR PARTS I AND II

Water Quality Control Branch
Pollution Control Division
Environmental Protection Services
Alberta Environment
Edmonton, Alberta

June 1986

This volume forms Part Three of the report entitled "North Saskatchewan River: Characterization of Water Quality in the Vicinity of Edmonton (1982-1983)".

Part One includes summaries of river basin characteristics, mixing properties, sampling dates and locations, measured variables, field methods, and laboratory methods. Results sections of Part One include temperature, dissolved oxygen, and results of analyses for major ions, metals, organic compounds, macronutrients, chlorophyll-a, carbon, bacteria, and BOD/COD.

Part Two summarizes the analysis of the zoobenthos (i.e. those invertebrates inhabiting the bottom sediments beneath the flowing water) and includes an interpretation of the value of the zoobenthos as an integrator in assessing year-round water quality conditions.

Part Three is a compendium of the analytical data for Parts One and Two. All graphs, tables and discussions in Part One and Part Two have been drawn from or based on this data base; no additional data, discussion, or analyses are included in Part Three, which consists of four sections:

1. NAQUADAT Summary Report for all analyses carried out on water samples collected from the North Saskatchewan River during the study period.
2. NAQUADAT Summary Report for analyses of final effluent grab samples from the sewage treatment plants licensed to discharge into the study section of the North Saskatchewan River.

3. NAQUADAT Summary Reports for analyses of final effluent grab samples from industries licensed to discharge wastewater into the study section of the North Saskatchewan River.
4. Analytical data from the zoobenthos study conducted in 1982 in the study section of the North Saskatchewan River.

SECTION 1

NAQUADAT Summary Report for all analyses carried out on water samples collected from the North Saskatchewan River during the study period.

```
REQUEST 0001 -  0003 PAGE   1                    NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                        SURFACE WATER DATA
STATION 00AL05DF2069    LAT. 53D 22M 19S  LONG. 113D 44M 50S   PR 3   UTM 12 317250E 5916950N  FOR MAY 19, 1982 TO FEB 29, 1984
 NORTH SASKATCHEWAN RIVER                       UPSTREAM OF DEVON BRIDGE
 COMPOSITE SAMPLE -  LEFT,CENTRE,RIGHT

                          97251F       02065F       08102F       02042F       02041L       10301L       08202L       08301L
                         DEPTH OF   TEMPERATURE     OXYGEN      SPECIFIC     SPECIFIC        PH          OXYGEN       OXYGEN
                         SAMPLING      WATER       DISSOLVED    CONDUCT.     CONDUCT.                   BIOCHEM.    TOTAL COD
                  SUBM  FROM SURF.                                                                   DEMAND-BOD
                   ID       M         DEG.C          02                                                  02           02
SAMPLES(FLAGS)            21(0)       24(0)         MG/L       USIE/CM       US/CM      PH UNITS        MG/L         MG/L
           LOW               .3          .5         24(0)       20(0)        24(0)       24(0)         21(5)        24(2)
          HIGH              3.4        22.5           6.6        220.         266.         8.1            .7         L5.0
       AVERAGE              1.5        12.8          14.8        410.         356.         8.5           2.9         97.4
      STD.DEV.               .9         6.6          10.0        329.         319.                       1.5*        16.2*
  PERCNT:10TH                .3          1.           2.1         45.          22.                        .6*        19.0*
          25TH              1.0         7.5           7.8        270.         289.         8.1            .9          5.5
   MEDIAN 50TH              1.5        15.5           8.5        315.         310.         8.3          L1.0          7.0
          75TH              1.8        17.8           9.2        330.         317.         8.4           1.3         12.0
          90TH              2.4        18.5          11.3        350.         332.         8.4           1.9         15.5
SECONDARY CODE                                       13.4        388.         344.         8.4           2.5         24.
                                                                                                                     04L

                          06536L       06005L       06154L       06107L       06905L       06715L       06721L       10151L
                         PHENOLIC      CARBON       CARBON       CARBON       CARBON      CHLORO -   CHLOROPHYLL   ALKALINITY
                         MATERIAL      TOTAL       DISSOLVED    DISSOLVED   PARTICULATE   PHYLL A        -A-         PHENOL
                          PHENOL      ORGANIC     INORGANIC     ORGANIC       TOTAL                   EPILITHON    PHTHALEIN
                  SUBM                   C            C            C            C                                  CACO3
                   ID      MG/L         MG/L         MG/L         MG/L         MG/L        MG/M3        MG/M2         MG/L
SAMPLES(FLAGS)            24(15)       11(0)        16(1)        16(1)        16(0)        9(0)         9(0)        22(12)
           LOW             L.002         4.8          L0.          L.4          .11          .43         3.91           .0
          HIGH              .009         11.         35.8          6.4         5.67         2.53        15.90         L4.2
       AVERAGE              .003*        7.7         30.5*         2.5*        1.32         1.19        9.118          2.3*
      STD.DEV.              .002*        1.8          8.2*         1.8*        1.30          .64        3.936          2.1*
  PERCNT:10TH              L.002          6.         29.0           .6          .36                                    .0
          25TH             L.002          6.         30.0          1.0          .64          .77         7.06           0.
   MEDIAN 50TH             L.002         7.9         32.0          1.9          .91         1.06         8.25         L4.2
          75TH              .002          9.         34.5          3.8         1.58         1.46        10.83         L4.2
          90TH              .003         9.5         35.0          4.7         2.08                                  L4.2
SECONDARY CODE            37L

                          10101L       06301L       06201L       17203L       16306L       09107L       14102L       10602L
                        ALKALINITY   CARBONATE    BICARBONT.    CHLORIDE     SULPHATE     FLUORIDE      SILICA      HARDNESS
                          TOTAL       (CALCD.)     (CALCD.)    DISSOLVED    DISSOLVED    DISSOLVED     REACTIVE       TOTAL
                  SUBM                                                                                             (CALCD.)
                   ID     CACO3         CO3          HCO3          CL          SO4           F           SIO2         CACO3
SAMPLES(FLAGS)             MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
           LOW            24(0)        22(12)       22(12)       24(24)       24(1)        24(0)        24(0)        24(0)
          HIGH             114.          0.         Q132.         L0.          L5.          .11          2.6         113.
       AVERAGE             149.         Q5.          182.         L1.0         47.          .16          5.6         177.
      STD.DEV.             132.         3.*          155.*                     34.*         .13          4.0         149.
  PERCNT:10TH               9.          3.*           12.*                     10.*         .01           .8          15.
          25TH             117.          0.          141.         L0.          25.          .11          3.0         134.
   MEDIAN 50TH             127.          0.         Q145.         L1.0         30.          .12          3.4         138.
          75TH             132.          5.          154.         L1.0         35.          .13          3.9         148.
          90TH             136.         Q5.         Q164.         L1.0         40.          .14          4.4         159.
SECONDARY CODE             147.         Q5.         Q169.         L0.          45.          .15          5.0         167.
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE   2                        NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                           SURFACE WATER DATA
STATION 00AL05DF2069    LAT. 53D 22M 19S  LONG. 113D 44M 50S   PR 3   UTM 12 317250E 5916950N  FOR MAY 19, 1982 TO FEB 29, 1984
  NORTH SASKATCHEWAN RIVER                      UPSTREAM OF DEVON BRIDGE
  COMPOSITE SAMPLE -  LEFT,CENTRE,RIGHT

                             20110L      12102L      11103L      19103L      15406L      15419L      07403L      07602L
                             CALCIUM    MAGNESIUM    SODIUM    POTASSIUM   PHOSPHOROUS  PHOSPHORUS   NITROGEN    NITROGEN
                            DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED    TOTAL       TOTAL     TOTAL ORG.    TOTAL
                                                                           PHOSPHATE   PHOSPHATE    (CALCD.)    (CALCD.)
                    SUBM       CA          MG          NA          K           P           P           N           N
                     ID       MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)               24(0)       24(0)       24(0)       24(0)       10(0)       12(1)      12(12)      24(23)
           LOW                  32.          8.          3.          .5        .011      L.006      Q.100       Q.150
          HIGH                  48.         14.          7.         1.1        .123       .062      Q.200       Q.650
       AVERAGE                  41.        11.2         4.3          .8        .038       .022*                   .402*
      STD.DEV.                   4.         1.3         1.0          .2        .036       .016*                   .170*
  PERCNT:10TH                   37.         10.          3.          .5        .014       .008      Q.100       Q.190
          25TH                  38.        10.0         4.0          .7        .017       .010       .100        .230
   MEDIAN 50TH                  41.        11.0         4.0          .8        .022       .018       .100        .460
          75TH                  44.        12.0         5.0          .9        .049       .029       .100        .550
          90TH                  47.        12.0          5.         1.0        .101       .032      Q.100       Q.550
SECONDARY CODE                                                                          21L

                             07021L      07503L      07562L      07205L      07206L      07105L      07906L      10407L
                            NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN     RESIDUE
                              TOTAL       TOTAL     DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED  PARTICULATE NONFILTRABLE
                            KJELDAHL     AMMONIA     AMMONIA     NITRITE     NITRITE   NO3 & NO2     TOTAL
                    SUBM        N           N           N           N           N           N           N
                     ID       MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)              24(11)      12(12)       12(1)      24(24)      12(11)      24(22)       16(9)       17(0)
           LOW                .100        L.4       L.002        L.05       L.007        L.05        L.01          4.
          HIGH                  .6        L.4        .025       L.050        .009        .070         .83         64.
       AVERAGE                .350*                  .010*                   .007*       .052*       .076*        16.
      STD.DEV.                .170*                  .006*                   .001*       .006*       .203*        15.
  PERCNT:10TH                 .140        L.4        .006        L.05       L.007        L.05        L.01          5.
          25TH                .170       L.40        .007       L.050       L.007       L.050       L.010          7.
   MEDIAN 50TH                .410*      L.40        .009       L.050       L.007       L.050       L.010         11.
          75TH               L.500       L.40        .011       L.050       L.007       L.050        .035         24.
          90TH                 L.5        L.4        .020        L.05       L.007       L.050         .10         28.
SECONDARY CODE            01L

                             10474L      10453L      00205L      36001L      36011L      36102L      36910L      29009L
                             RESIDUE     RESIDUE      TOTAL     COLIFORMS   COLIFORMS    STREP.    STD. PLATE    COPPER
                              TOTAL     FILTRABLE   DISSOLVED     TOTAL       FECAL       FECAL       COUNT       TOTAL
                                                     SOLIDS                                        BACT.DENS.
                    SUBM                                           MPN         MPN         MF                      CU
                     ID       MG/L        MG/L        MG/L      NO/100ML    NO/100ML    NO/100ML      NO/ML       MG/L
SAMPLES(FLAGS)               17(0)       17(0)       24(0)       21(1)       21(3)       21(1)       20(0)      24(10)
           LOW                 208.        180.        120.        L10.         L2.         L2.         12.      L.001
          HIGH                 354.        340.        204.        450.        120.        350.      20000.       .016
       AVERAGE                 267.        251.        172.         92.*        20.*        57.*      1286.       .003*
      STD.DEV.                  47.         44.         17.        119.*        28.*        87.*      4423.       .003*
  PERCNT:10TH                  210.        200.        156.         10.          2.          2.         33.      L.001
          25TH                 244.        230.        162.         28.          4.          6.         61.      L.001
   MEDIAN 50TH                 247.        240.        172.         56.         10.         18.        120.       .003
          75TH                 284.        270.        184.         70.         22.         50.        465.       .004
          90TH                 345.        320.        191.        230.         48.        180.       1290.       .006
SECONDARY CODE                                              02L         12L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE   3                     NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                     SURFACE WATER DATA
STATION 00AL05DF2069    LAT. 53D 22M 19S  LONG. 113D 44M 50S   PR 3   UTM 12 317250E 5916950N  FOR MAY 19, 1982 TO FEB 29, 1984
 NORTH SASKATCHEWAN RIVER                 UPSTREAM OF DEVON BRIDGE
 COMPOSITE SAMPLE -  LEFT,CENTRE,RIGHT

                           30009L       26304L      13306L      25003L      28009L      42009L      27009L      33005L
                            ZINC         IRON      ALUMINUM   MANGANESE     NICKEL    MOLYBDENUM    COBALT      ARSENIC
                           TOTAL       EXTRBLE.    EXTRBLE.     TOTAL       TOTAL       TOTAL       TOTAL       TOTAL

                    SUBM    ZN           FE          AL          MN          NI          MO          CO          AS
                     ID    MG/L         MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)             24(1)        24(6)       20(1)       21(8)       24(3)       20(20)      24(21)      15(2)
           LOW             L.001          .05       L.020       L.008       L.001       L.001       L.001      L.0002
          HIGH              .043         1.04       3.050        .087        .040       L.001        .012       .0011
       AVERAGE              .018*         .29        .396*       .018*       .006*                   .002*      .0005*
      STD.DEV.              .015*         .27        .685*       .018*       .008*                   .002*      .0002*
  PERCNT:10TH               .003          .08        .052       L.008       L.001       L.001       L.001      L.0002
          25TH              .005          .12        .084       L.008        .003       L.001       L.001       .0003
   MEDIAN 50TH              .013          .17        .149        .010        .004       L.001       L.001       .0004
          75TH              .033          .37        .308        .020        .006       L.001       L.001       .0006
          90TH              .040          .58        .946        .030        .011       L.001        .003       .0007
SECONDARY CODE

                           04304L       48009L      24009L      82302L      82009L      80015L      34005L      23009L
                          BERYLLIUM     CADMIUM    CHROMIUM      LEAD        LEAD       MERCURY    SELENIUM    VANADIUM
                           EXTRBLE.      TOTAL       TOTAL     EXTRBLE.      TOTAL       TOTAL      TOTAL        TOTAL

                    SUBM    BE           CD          CR          PB          PB          HG          SE          V
                     ID    MG/L         MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)             20(20)       24(14)      24(7)       9(7)        12(9)       12(12)      15(13)      20(8)
           LOW             L.001        L.001       L.001       L.003       L.003      L.0001      L.0002       L.002
          HIGH             L.001         .007        .044        .004        .014      L.0001       .0004        .010
       AVERAGE                           .002*       .006*       .003*       .004*                  .0002*       .004*
      STD.DEV.                           .002*       .009*       .000*       .003*                  .0001*       .002*
  PERCNT:10TH              L.001        L.001       L.001                   L.003      L.0001      L.0002       L.002
          25TH             L.001        L.001       L.001       L.003       L.003      L.0001      L.0002       L.002
   MEDIAN 50TH             L.001        L.001        .004       L.003       L.003      L.0001      L.0002        .003
          75TH             L.001         .004        .005       L.003        .003*     L.0001      L.0002        .004
          90TH             L.001         .005        .009                    .006      L.0001       .0003        .006
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE   4                  NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                     SURFACE WATER DATA
STATION 00AL05DF2075    LAT. 53D 28M 33S  LONG. 113D 37M 10S   PR 3   UTM 12 326150E 5928200N  FOR MAY 19, 1982 TO NOV 02, 1982
 NORTH SASKATCHEWAN RIVER                  UPSTREAM OF E.L. SMITH PUMP HOUSE
 COMPOSITE SAMPLE -  LEFT,CENTRE,RIGHT

                         97251F        02065F        08102F        02042F        02041L        10301L        08202L        08301L
                        DEPTH OF    TEMPERATURE      OXYGEN       SPECIFIC      SPECIFIC        PH          OXYGEN        OXYGEN
                        SAMPLING       WATER       DISSOLVED     CONDUCT.      CONDUCT.                   BIOCHEM.     TOTAL COD
                                                                                                        DEMAND-BOD
                  SUBM  FROM SURF.                    O2                                                     O2           O2
                   ID       M          DEG.C         MG/L         USIE/CM       US/CM       PH UNITS        MG/L         MG/L
SAMPLES(FLAGS)            12(0)        12(0)         12(0)         11(0)         12(0)        12(0)        12(0)        12(0)
           LOW              1.7           .5           7.8          300.          260.          8.2           .5          6.5
          HIGH              5.5          20.          15.0          410.          365.          8.5          3.5         23.
       AVERAGE              3.5         13.7          10.3          348.          314.                       1.6         12.3
      STD.DEV.              1.1          6.4           2.3           35.           27.                        .9          4.9
  PERCNT:10TH               2.3           4.           8.2          310.          288.          8.2           .7          8.8
          25TH              2.7          9.5           8.9          315.          302.          8.3           .8          8.9
   MEDIAN 50TH              3.4         15.8           9.1          340.          315.          8.4          1.2         11.0
          75TH              4.4         18.5          12.1          375.          331.          8.4          2.3         14.0
          90TH              4.6         18.8          13.4          390.          337.          8.5          2.7         20.
SECONDARY CODE

                         06536L        06005L        06154L        06107L        06905L        06715L        06721L        10151L
                        PHENOLIC       CARBON        CARBON        CARBON        CARBON      CHLORO -    CHLOROPHYLL   ALKALINITY
                        MATERIAL       TOTAL       DISSOLVED     DISSOLVED   PARTICULATE     PHYLL A         -A-          PHENOL
                         PHENOL       ORGANIC      INORGANIC      ORGANIC        TOTAL                     EPILITHON    PHTHALEIN
                  SUBM                   C             C             C             C                                    CACO3
                   ID     MG/L          MG/L          MG/L          MG/L          MG/L          MG/M3         MG/M2        MG/L
SAMPLES(FLAGS)            12(9)        11(0)                                                                             12(8)
           LOW           L.002           5.                                                                                .0
          HIGH            .003          11.                                                                              L4.2
       AVERAGE            .002*          8.3                                                                              2.8*
      STD.DEV.            .000*          2.2                                                                              2.1*
  PERCNT:10TH            L.002           6.                                                                               0.
          25TH           L.002           6.4                                                                               .0
   MEDIAN 50TH           L.002           7.6                                                                             L4.2
          75TH            .002*         10.                                                                              L4.2
          90TH            .002          11.                                                                              L4.2
SECONDARY CODE

                         10101L        06301L        06201L        17203L        16306L        09107L        14102L        10602L
                       ALKALINITY    CARBONATE     BICARBONT.     CHLORIDE      SULPHATE      FLUORIDE       SILICA      HARDNESS
                         TOTAL        (CALCD.)      (CALCD.)     DISSOLVED     DISSOLVED     DISSOLVED     REACTIVE       TOTAL
                                                                                                                       (CALCD.)
                  SUBM    CACO3          CO3          HCO3           CL           SO4            F            SIO2        CACO3
                   ID     MG/L          MG/L         MG/L           MG/L          MG/L          MG/L          MG/L         MG/L
SAMPLES(FLAGS)            12(0)         12(8)         12(8)        12(11)        12(0)         12(0)         12(0)        12(0)
           LOW             113.           0.          Q128.          L0.           20.           .11           3.0         115.
          HIGH             151.          Q5.           178.           1.           40.           .15           5.6         159.
       AVERAGE             132.           3.*          154.*          1.0*         31.           .13           4.1         142.
      STD.DEV.              11.           2.*           14.*           .0*          6.           .01            .7          12.
  PERCNT:10TH              116.           0.           141.          L0.           25.           .12           3.2         134.
          25TH             127.           0.           145.          L1.0          26.           .12           3.7         136.
   MEDIAN 50TH             130.           5.           155.          L1.0          30.           .12           4.0         142.
          75TH             140.           5.           161.          L1.0          35.           .14           4.5         153.
          90TH             146.          Q5.          Q174.          L0.           40.           .14           5.0         157.
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE   5                    NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                     SURFACE WATER DATA
STATION 00AL05DF2075    LAT. 53D 28M 33S  LONG. 113D 37M 10S   PR 3   UTM 12 326150E 5928200N  FOR MAY 19, 1982 TO NOV 02, 1982
 NORTH SASKATCHEWAN RIVER                  UPSTREAM OF E.L. SMITH PUMP HOUSE
 COMPOSITE SAMPLE -  LEFT,CENTRE,RIGHT

                          20110L      12102L      11103L      19103L      15406L      15419L      07403L      07602L
                          CALCIUM    MAGNESIUM    SODIUM    POTASSIUM  PHOSPHOROUS  PHOSPHORUS   NITROGEN    NITROGEN
                         DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED    TOTAL       TOTAL     TOTAL ORG.    TOTAL
                                                                        PHOSPHATE   PHOSPHATE    (CALCD.)    (CALCD.)
                   SUBM     CA          MG          NA          K           P           P           N           N
                    ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            12(0)       12(0)       12(0)       12(0)       10(0)        5(0)       12(12)      12(12)
           LOW              33.          8.          2.          .5         .009        .009       Q.100       Q.550
          HIGH              44.         12.          5.          .9         .106        .024       Q.100       Q.550
       AVERAGE              40.         10.3         4.0         .8         .038        .017
      STD.DEV.               3.          1.2         1.0         .1         .036        .006
   PERCNT:10TH              37.          9.          3.          .7         .011                   Q.100       Q.550
          25TH              38.         10.0         3.5         .8         .015        .015        .100        .550
   MEDIAN 50TH              40.         10.0         4.0         .8         .021        .016        .100        .550
          75TH              44.         11.0         5.0         .9         .048        .023        .100        .550
          90TH              44.         12.          5.          .9         .103                   Q.100       Q.550
SECONDARY CODE                                                                         21L

                          07021L      07503L      07562L      07205L      07206L      07105L      07906L      10407L
                         NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    RESIDUE
                          TOTAL       TOTAL     DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED  PARTICULATE NONFILTRABLE
                         KJELDAHL    AMMONIA     AMMONIA     NITRITE     NITRITE    NO3 & NO2    TOTAL
                   SUBM     N           N           N           N           N           N           N
                    ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            12(7)       12(12)       5(0)       12(12)      12(12)      12(12)                    5(0)
           LOW             .090         L.4        .008        L.05       L.001        L.05                      6.
          HIGH             L.5          L.4        .018        L.05       L.007        L.05                     21.
       AVERAGE             .357*                   .013                                                         11.
      STD.DEV.             .181*                   .005                                                          6.
   PERCNT:10TH             .100         L.4                    L.05       L.007        L.05
          25TH             .165         L.40       .009        L.050      L.007        L.050                     7.
   MEDIAN 50TH            L.500         L.40       .011        L.050      L.007        L.050                    11.
          75TH            L.500         L.40       .017        L.050      L.007        L.050                    12.
          90TH             L.5          L.4                    L.05       L.007        L.05
SECONDARY CODE           01L

                          10474L      10453L      00205L      36001L      36011L      36102L      36910L      29009L
                          RESIDUE     RESIDUE      TOTAL     COLIFORMS   COLIFORMS     STREP.   STD. PLATE    COPPER
                           TOTAL     FILTRABLE   DISSOLVED     TOTAL       FECAL       FECAL       COUNT       TOTAL
                                                  SOLIDS                                         BACT.DENS.
                   SUBM                                        MPN         MPN          MF                      CU
                    ID     MG/L        MG/L        MG/L      NO/100ML    NO/100ML    NO/100ML     NO/ML        MG/L
SAMPLES(FLAGS)             5(0)        5(0)       12(0)       11(1)       11(0)       11(0)        9(0)       12(3)
           LOW             221.        200.        134.         10.          2.          2.         14.       L.001
          HIGH             356.        350.        184.        290.         60.        400.        750.        .006
       AVERAGE             269.        258.        166.         89.*        17.         74.        204.        .003*
      STD.DEV.              54.         58.         14.         93.*        16.        114.        272.        .002*
   PERCNT:10TH                                     154.         16.          2.          4.                   L.001
          25TH             227.        220.        159.         16.          8.          6.         40.        .001*
   MEDIAN 50TH             262.        250.        168.         40.         18.         50.         66.        .003
          75TH             281.        270.        178.        150.         22.         76.        160.        .004
          90TH                                     183.        220.         24.        110.                    .005
SECONDARY CODE                                              02L         12L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE   6                    NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                       SURFACE WATER DATA
STATION 00AL05DF2075    LAT. 53D 28M 33S  LONG. 113D 37M 10S   PR 3   UTM 12 326150E 5928200N  FOR MAY 19, 1982 TO NOV 02, 1982
 NORTH SASKATCHEWAN RIVER                    UPSTREAM OF E.L. SMITH PUMP HOUSE
 COMPOSITE SAMPLE -  LEFT,CENTRE,RIGHT
                          30009L      26304L      13306L      25003L      28009L      42009L      27009L      33005L
                           ZINC        IRON      ALUMINUM   MANGANESE     NICKEL    MOLYBDENUM    COBALT     ARSENIC
                          TOTAL      EXTRBLE.    EXTRBLE.     TOTAL       TOTAL       TOTAL       TOTAL      TOTAL

                 SUBM      ZN          FE          AL          MN          NI          MO          CO          AS
                  ID      MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            12(1)       12(0)        8(0)        9(3)       12(0)        8(7)       12(11)       6(1)
           LOW            L.001         .08        .088       L.008        .004       L.001       L.001      L.0002
          HIGH             .048        1.21       2.680        .084        .012        .004        .005       .0005
       AVERAGE             .027*        .37        .645        .022*       .006        .001*       .001*      .0004*
      STD.DEV.             .014*        .35        .855        .024*       .003        .001*       .001*      .0001*
   PERCNT:10TH             .011         .13                                .004                   L.001
          25TH             .016         .16        .178       L.008        .004       L.001       L.001       .0003
    MEDIAN 50TH            .029         .23        .375        .012        .005       L.001       L.001       .0004
          75TH             .036         .43        .642        .025        .008       L.001       L.001       .0004
          90TH             .046         .88                                .009                   L.001
SECONDARY CODE
                          04304L      48009L      24009L      82302L      82009L      80015L      34005L      23009L
                         BERYLLIUM    CADMIUM    CHROMIUM      LEAD        LEAD       MERCURY    SELENIUM    VANADIUM
                          EXTRBLE.     TOTAL       TOTAL     EXTRBLE.      TOTAL       TOTAL      TOTAL       TOTAL

                 SUBM      BE          CD          CR          PB          PB          HG          SE          V
                  ID      MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)             8(8)       12(8)       12(1)                   12(8)                    6(6)        8(2)
           LOW            L.001       L.001       L.001                   L.003                   L.0002      L.002
          HIGH            L.001        .003        .014                    .022                   L.0002       .009
       AVERAGE                         .001*       .006*                   .005*                               .004*
      STD.DEV.                         .001*       .004*                   .005*                               .002*
   PERCNT:10TH                        L.001        .003                   L.003
          25TH            L.001       L.001        .004                   L.003                   L.0002       .002*
    MEDIAN 50TH           L.001       L.001        .005                   L.003                   L.0002       .003
          75TH            L.001        .002        .007                    .004                   L.0002       .006
          90TH                         .003        .012                    .004
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE   7                        NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                       SURFACE WATER DATA
STATION 00AL05DF2110    LAT. 53D 30M 21S  LONG. 113D 33M 24S   PR 4   UTM 12 330400E 5931300N  FOR JUN 14, 1982 TO NOV 15, 1983
 WHITEMUD CREEK - NEAR THE MOUTH           AT CONFLUENCE WITH NSR

                        97251F      02065F      08102F      02042F      02041L      10301L      08202L      08301L
                       DEPTH OF   TEMPERATURE   OXYGEN     SPECIFIC    SPECIFIC       PH        OXYGEN      OXYGEN
                       SAMPLING      WATER    DISSOLVED    CONDUCT.    CONDUCT.                BIOCHEM.   TOTAL COD
                                                                                             DEMAND-BOD
                 SUBM  FROM SURF.                 O2                                             O2          O2
                  ID       M         DEG.C       MG/L       USIE/CM      US/CM     PH UNITS     MG/L        MG/L
SAMPLES(FLAGS)           7(0)        9(0)        8(0)        8(0)       10(0)       10(0)        9(0)        9(0)
           LOW             .3          5.5         5.4        415.        406.         7.6         1.8        15.9
          HIGH            1.0         22.5        13.0       1350.       1478.         8.4         7.4       189.4
       AVERAGE             .5         15.8         9.0        807.        809.                     4.1        68.5
      STD.DEV.             .3          5.6         2.1        337.        405.                     2.0        52.3
  PERCNT:10TH                                                             424.         7.7
          25TH             .3         15.          8.2        510.        471.         7.9         2.6        34.9
   MEDIAN 50TH             .3         16.0         8.8        810.        724.         8.1         4.0        58.4
          75TH             .6         19.0         9.6       1025.       1056.         8.2         4.6        90.0
          90TH                                                           1452.         8.3
SECONDARY CODE                                                                                            04L

                        06536L      06005L      06154L      06107L      06905L      06715L      06721L      10151L
                       PHENOLIC     CARBON      CARBON      CARBON      CARBON     CHLORO -   CHLOROPHYLL ALKALINITY
                       MATERIAL     TOTAL     DISSOLVED   DISSOLVED  PARTICULATE   PHYLL A        -A-       PHENOL
                        PHENOL     ORGANIC    INORGANIC    ORGANIC      TOTAL                 EPILITHON   PHTHALEIN
                 SUBM                  C           C           C           C                                CACO3
                  ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/M3        MG/M2       MG/L
SAMPLES(FLAGS)          10(0)                   10(0)       10(0)       10(0)        9(0)                   10(1)
           LOW           .005                    24.0         4.6        1.00        3.50                      .0
          HIGH           .124                    76.0        30.0        6.31       37.02                    L4.2
       AVERAGE           .024                    53.7        17.4        3.32       14.79                      .4*
      STD.DEV.           .036                    19.6         8.1        1.98       11.38                     1.3*
  PERCNT:10TH            .007                    27.0         5.9        1.16                                  .0
          25TH           .009                    37.0        14.5        1.58        7.97                      .0
   MEDIAN 50TH           .013                    59.5        17.1        3.01       10.44                      .0
          75TH           .017                    69.0        21.0        4.50       20.62                      .0
          90TH           .074                    75.0        29.5        6.30                                 2.1*
SECONDARY CODE         37L

                        10101L      06301L      06201L      17203L      16306L      09107L      14102L      10602L
                      ALKALINITY  CARBONATE   BICARBONT.   CHLORIDE    SULPHATE    FLUORIDE     SILICA     HARDNESS
                         TOTAL     (CALCD.)     (CALCD.)   DISSOLVED   DISSOLVED   DISSOLVED   REACTIVE      TOTAL
                                                                                                           (CALCD.)
                 SUBM    CACO3        CO3        HCO3          CL        SO4           F         SIO2        CACO3
                  ID     MG/L        MG/L       MG/L          MG/L       MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)          10(0)       10(1)        10(1)       10(0)        9(0)       10(0)       10(0)       10(0)
           LOW           102.          0.         124.          5.         55.         .08         1.7        128.
          HIGH           333.         85.         406.         79.        455.         .33        12.4        545.
       AVERAGE           221.          1.*        268.*       21.3        158.         .24         5.1        280.
      STD.DEV.            80.          2.*         98.*       22.0        127.         .08         3.4        147.
  PERCNT:10TH            107.          0.         130.         6.0                     .13         1.7        139.
          25TH           159.          0.         194.          8.         78.         .20         2.6        167.
   MEDIAN 50TH           243.          0.         290.        14.5        115.         .24         4.3        237.
          75TH           277.          0.         338.         26.        161.         .32         7.2        347.
          90TH           313.          3.         382.        52.5                     .33         9.8        530.
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

NAQUADAT SUMMARY REPORT APR 30, 1986
SURFACE WATER DATA

STATION 00AL05DF2110 LAT. 53D 30M 21S LONG. 113D 33M 24S PR 4 UTM 12 330400E 5931300N FOR JUN 14, 1982 TO NOV 15, 1983
WHITEMUD CREEK - NEAR THE MOUTH AT CONFLUENCE WITH NSR

	20110L CALCIUM DISSOLVED	12102L MAGNESIUM DISSOLVED	11103L SODIUM DISSOLVED	19103L POTASSIUM DISSOLVED	15406L PHOSPHOROUS TOTAL PHOSPHATE	15419L PHOSPHORUS TOTAL PHOSPHATE	07403L NITROGEN TOTAL ORG. (CALCD.)	07602L NITROGEN TOTAL (CALCD.)
SUBM	CA	MG	NA	K	P	P	N	N
ID	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
SAMPLES(FLAGS)	10(0)	10(0)	10(0)	10(0)		9(0)		10(6)
LOW	38.	8.	21.	2.7		.055		Q.550
HIGH	139.	48.	129.	14.0		1.030		3.640
AVERAGE	75.	22.4	62.9	9.4		.362		1.963*
STD.DEV.	38.	13.1	38.2	3.9		.343		1.108*
PERCNT:10TH	39.	10.0	22.5	3.0				.625
25TH	47.	12.	32.	7.8		.070		Q1.070
MEDIAN 50TH	65.	18.5	57.0	10.1		.280		1.745
75TH	91.	29.	97.	12.0		.420		Q2.900
90TH	139.	44.5	115.0	13.5				3.520
SECONDARY CODE						21L		

	07021L NITROGEN TOTAL KJELDAHL	07503L NITROGEN TOTAL AMMONIA	07562L NITROGEN DISSOLVED AMMONIA	07205L NITROGEN DISSOLVED NITRITE	07206L NITROGEN DISSOLVED NITRITE	07105L NITROGEN DISSOLVED NO3 & NO2	07906L NITROGEN PARTICULATE TOTAL	10407L RESIDUE NONFILTRABLE
SUBM	N	N	N	N	N	N	N	
ID	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
SAMPLES(FLAGS)	10(0)		9(0)	9(7)		10(6)	9(3)	10(0)
LOW	.500		.013	L.05		L.05	L.01	9.
HIGH	3.250		.310	.08		.48	1.09	753.
AVERAGE	1.771		.092	.054*		.192*	.351*	116.
STD.DEV.	1.012		.110	.010*		.186*	.370*	229.
PERCNT:10TH	.575					L.050		12.
25TH	1.020		.022	L.05		L.05	L.01	17.
MEDIAN 50TH	1.580		.032	L.05		L.050	.24	24.
75TH	2.850		.124	L.05		.39	.59	122.
90TH	3.125					.440		454.
SECONDARY CODE								

	10474L RESIDUE TOTAL	10453L RESIDUE FILTRABLE	00205L TOTAL DISSOLVED SOLIDS	36001L COLIFORMS TOTAL	36011L COLIFORMS FECAL	36102L STREP. FECAL	36910L STD. PLATE COUNT BACT.DENS.	29009L COPPER TOTAL
SUBM				MPN	MPN	MF		CU
ID	MG/L	MG/L	MG/L	NO/100ML	NO/100ML	NO/100ML	NO/ML	MG/L
SAMPLES(FLAGS)	10(0)	10(0)	10(0)	9(0)	9(1)	9(1)	9(0)	10(1)
LOW	365.	340.	228.	80.	L10.	L10.	440.	L.001
HIGH	1113.	1090.	977.	17000.	3100.	1300.	25000.	.029
AVERAGE	718.	613.	504.	2833.	528.*	210.*	5688.	.010*
STD.DEV.	291.	281.	283.	5361.	972.*	410.*	7971.	.011*
PERCNT:10TH	367.	350.	247.					.001*
25TH	489.	360.	272.	500.	170.	56.	800.	.002
MEDIAN 50TH	644.	535.	431.	1200.	240.	80.	3600.	.004
75TH	1054.	810.	667.	1800.	350.	110.	4800.	.012
90TH	1108.	1065.	967.					.028
SECONDARY CODE								

* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q

```
REQUEST 0007 -  0009 PAGE   9                   NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                    SURFACE WATER DATA
STATION 00AL05DF2110    LAT. 53D 30M 21S  LONG. 113D 33M 24S   PR 4   UTM 12 330400E 5931300N  FOR JUN 14, 1982 TO NOV 15, 1983
 WHITEMUD CREEK - NEAR THE MOUTH          AT CONFLUENCE WITH NSR

                         30009L     26304L     13306L     25003L     28009L     42009L     27009L     33005L
                         ZINC       IRON       ALUMINUM   MANGANESE  NICKEL     MOLYBDENUM COBALT     ARSENIC
                         TOTAL      EXTRBLE.   EXTRBLE.   TOTAL      TOTAL      TOTAL      TOTAL      TOTAL

                   SUBM  ZN         FE         AL         MN         NI         MO         CO         AS
                    ID   MG/L       MG/L       MG/L       MG/L       MG/L       MG/L       MG/L       MG/L
SAMPLES(FLAGS)           10(0)      10(0)      10(0)      10(0)      10(0)      9(7)       10(6)      10(0)
             LOW           .006        .15       .035       .061       .003     L.001      L.001      .0008
            HIGH           .090       9.22      8.830       .370       .030      .008       .010      .0100
         AVERAGE           .035       1.75       .983       .219       .014      .002*      .003*     .0035
        STD.DEV.           .034       2.78      2.759       .096       .008      .002*      .003*     .0027
    PERCNT:10TH            .007        .26       .043       .090       .005                L.001      .0010
            25TH           .009        .47       .065       .172       .010     L.001      L.001      .0016
     MEDIAN 50TH           .018        .66       .076       .218       .012     L.001      L.001      .0029
            75TH           .080       1.37       .200       .259       .018     L.001       .003      .0043
            90TH           .086       6.29      4.588       .362       .028                 .008      .0078
  SECONDARY CODE
                         04304L     48009L     24009L     82302L     82009L     80015L     34005L     23009L
                         BERYLLIUM  CADMIUM    CHROMIUM   LEAD       LEAD       MERCURY    SELENIUM   VANADIUM
                          EXTRBLE.  TOTAL      TOTAL      EXTRBLE.   TOTAL      TOTAL      TOTAL      TOTAL

                   SUBM  BE         CD         CR         PB         PB         HG         SE         V
                    ID   MG/L       MG/L       MG/L       MG/L       MG/L       MG/L       MG/L       MG/L
SAMPLES(FLAGS)           10(10)     10(5)      10(1)      9(3)                  10(10)     9(8)       10(1)
             LOW         L.001      L.001      L.001      L.003                 L.0001     L.0002     L.002
            HIGH         L.001       .010       .015       .073                 L.0001      .0004      .028
         AVERAGE                     .002*      .006*      .017*                            .0002*     .008*
        STD.DEV.                     .003*      .004*      .023*                            .0001*     .008*
    PERCNT:10TH          L.001      L.001       .002*                           L.0001                 .002*
            25TH         L.001      L.001       .004      L.003                 L.0001     L.0002      .004
     MEDIAN 50TH         L.001       .001*      .005       .005                 L.0001     L.0002      .006
            75TH         L.001       .002       .007       .018                 L.0001     L.0002      .007
            90TH         L.001       .007       .012                            L.0001                 .020
  SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  10                     NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                      SURFACE WATER DATA
STATION 00AL05EA1020    LAT. 53D 47M 15S  LONG. 113D 13M 21S   PR 4   UTM 12 353600E 5961900N  FOR MAY 26, 1983 TO NOV 17, 1983
 STURGEON RIVER - MOUTH

                          97251F      02065F      08102F      02042F      02041L      10301L      08202L      08301L
                         DEPTH OF   TEMPERATURE   OXYGEN     SPECIFIC    SPECIFIC       PH        OXYGEN      OXYGEN
                         SAMPLING      WATER     DISSOLVED   CONDUCT.    CONDUCT.                BIOCHEM.   TOTAL COD
                                                                                                DEMAND-BOD
                  SUBM  FROM SURF.                  O2                                              O2          O2
                   ID       M         DEG.C        MG/L      USIE/CM       US/CM     PH UNITS      MG/L        MG/L
SAMPLES(FLAGS)            6(0)        9(0)        9(0)        9(0)        9(0)        9(0)        6(0)        9(0)
           LOW              .1           .3         6.7        420.        396.         7.7         1.6        43.4
          HIGH             1.8         23.0        13.8       1000.       1188.         8.5         6.5        74.0
       AVERAGE              .6         15.7         9.8        638.        629.                     3.3        59.4
      STD.DEV.              .6          7.2         2.4        174.        229.                     1.8         9.8
  PERCNT:10TH
          25TH              .3         14.          7.8        575.        532.         7.9         1.8        52.8
   MEDIAN 50TH              .3         19.5         9.7        600.        571.         8.2         3.0        58.3
          75TH              .6         20.         11.3        670.        639.         8.4         3.7        65.8
          90TH
SECONDARY CODE                                                                                                 04L

                          06536L      06005L      06154L      06107L      06905L      06715L      06721L      10151L
                         PHENOLIC     CARBON      CARBON      CARBON      CARBON     CHLORO -   CHLOROPHYLL  ALKALINITY
                         MATERIAL     TOTAL      DISSOLVED   DISSOLVED  PARTICULATE  PHYLL A       -A-        PHENOL
                          PHENOL     ORGANIC     INORGANIC    ORGANIC     TOTAL                 EPILITHON   PHTHALEIN
                  SUBM                  C           C           C           C                                CACO3
                   ID      MG/L        MG/L        MG/L        MG/L        MG/L        MG/M3       MG/M2        MG/L
SAMPLES(FLAGS)            9(0)                    9(0)        9(0)        9(0)        9(0)                    9(1)
           LOW            .007                    25.0        14.0        1.22        5.38                      .0
          HIGH            .012                    63.0        23.0       17.15      114.51                     6.7
       AVERAGE            .009                    46.7        16.9        4.88       28.70                     1.7*
      STD.DEV.            .002                    11.7         2.9        5.00       34.31                     2.6*
  PERCNT:10TH
          25TH            .008                    42.0        15.0        2.20       12.03                      .0
   MEDIAN 50TH            .008                    47.0        16.0        2.70       14.17                      .0
          75TH            .008                    55.0        19.0        4.80       21.48                     L4.2
          90TH
SECONDARY CODE       37L

                          10101L      06301L      06201L      17203L      16306L      09107L      14102L      10602L
                        ALKALINITY  CARBONATE   BICARBONT.   CHLORIDE    SULPHATE    FLUORIDE     SILICA     HARDNESS
                          TOTAL      (CALCD.)    (CALCD.)   DISSOLVED   DISSOLVED   DISSOLVED    REACTIVE      TOTAL
                                                                                                             (CALCD.)
                  SUBM    CACO3        CO3        HCO3          CL         SO4          F          SIO2        CACO3
                   ID      MG/L        MG/L       MG/L         MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            9(0)        9(1)        9(1)        9(0)        9(0)        9(0)        9(2)        9(0)
           LOW            104.          0.        127.          4.         55.         .17         L.5        134.
          HIGH            259.          8.        316.         38.        285.         .38         9.1        360.
       AVERAGE            192.          2.*       230.*       10.3        115.         .21         3.9*       211.
      STD.DEV.             47.          3.*        56.*       10.6         70.         .07         2.9*        67.
  PERCNT:10TH
          25TH            188.          0.        223.          6.         75.         .18         1.8        174.
   MEDIAN 50TH            198.          0.       Q231.          7.         90.         .19         3.1        207.
          75TH            217.          5.        265.          9.        115.         .20         5.8        210.
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  11                    NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                    SURFACE WATER DATA
STATION 00AL05EA1020    LAT. 53D 47M 15S  LONG. 113D 13M 21S   PR 4   UTM 12 353600E 5961900N  FOR MAY 26, 1983 TO NOV 17, 1983
 STURGEON RIVER - MOUTH

                          20110L      12102L      11103L      19103L      15406L      15419L      07403L      07602L
                          CALCIUM     MAGNESIUM   SODIUM      POTASSIUM   PHOSPHOROUS PHOSPHORUS  NITROGEN    NITROGEN
                          DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED   TOTAL       TOTAL       TOTAL ORG.  TOTAL
                                                                          PHOSPHATE   PHOSPHATE   (CALCD.)    (CALCD.)
                  SUBM    CA          MG          NA          K           P           P           N           N
                   ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)              9(0)        9(0)        9(0)        9(0)                    8(0)                    9(3)
           LOW               37.         10.         31.         6.1                    .090                  Q1.050
          HIGH               85.         36.        102.         9.7                    .780                   4.470
       AVERAGE               53.         19.1        47.0        8.0                    .258                   2.243*
      STD.DEV.               15.          7.5        21.9         .9                    .248                    .998*
  PERCNT:10TH
          25TH               45.         15.         36.         7.7                    .101                  Q1.500
   MEDIAN 50TH               52.         17.         38.         8.1                    .115                   2.250
          75TH               56.         20.         49.         8.2                    .383                   2.510
          90TH
SECONDARY CODE                                                                      21L

                          07021L      07503L      07562L      07205L      07206L      07105L      07906L      10407L
                          NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    RESIDUE
                          TOTAL       TOTAL       DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED   PARTICULATE NONFILTRABLE
                          KJELDAHL    AMMONIA     AMMONIA     NITRITE     NITRITE     NO3 & NO2   TOTAL
                  SUBM    N           N           N           N           N           N           N
                   ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)              9(0)                    9(0)        9(8)                    9(3)        9(1)        9(0)
           LOW             1.000                    .007        L.05                    L.05        L.01         10.
          HIGH             3.400                   1.040         .12                    1.07        1.17        104.
       AVERAGE             1.853                    .152        .058*                   .390*       .482*        45.
      STD.DEV.              .682                    .335        .023*                   .335*       .357*        41.
  PERCNT:10TH
          25TH             1.450                    .016        L.05                    L.05         .19         16.
   MEDIAN 50TH             1.800                    .029        L.05                     .42         .49         23.
          75TH             1.950                    .086        L.05                     .47         .69         96.
          90TH
SECONDARY CODE

                          10474L      10453L      00205L      36001L      36011L      36102L      36910L      29009L
                          RESIDUE     RESIDUE     TOTAL       COLIFORMS   COLIFORMS   STREP.      STD. PLATE  COPPER
                          TOTAL       FILTRABLE   DISSOLVED   TOTAL       FECAL       FECAL       COUNT       TOTAL
                                                  SOLIDS                                          BACT.DENS.
                  SUBM                                        MPN         MPN         MF                      CU
                   ID     MG/L        MG/L        MG/L        NO/100ML    NO/100ML    NO/100ML    NO/ML       MG/L
SAMPLES(FLAGS)              9(0)        9(0)        9(0)        8(0)        8(1)        8(0)        8(0)        9(2)
           LOW              386.        290.        229.         12.         L2.          8.        380.       L.001
          HIGH              853.        830.        715.       3400.        400.        200.      15000.        .034
       AVERAGE              527.        482.        369.        620.         88.*        60.       4401.        .011*
      STD.DEV.              141.        164.        142.       1141.        137.*        69.       4885.        .012*
  PERCNT:10TH
          25TH              465.        400.        301.         69.         11.         14.        865.        .002
   MEDIAN 50TH              504.        450.        332.        180.         23.         28.       3250.        .007
          75TH              550.        540.        373.        525.        119.         95.       5800.        .019
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  12                    NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                      SURFACE WATER DATA
STATION 00AL05EA1020    LAT. 53D 47M 15S  LONG. 113D 13M 21S   PR 4   UTM 12 353600E 5961900N  FOR MAY 26, 1983 TO NOV 17, 1983
 STURGEON RIVER - MOUTH

                         30009L       26304L       13306L       25003L       28009L       42009L       27009L       33005L
                          ZINC         IRON       ALUMINUM     MANGANESE     NICKEL     MOLYBDENUM     COBALT      ARSENIC
                         TOTAL       EXTRBLE.     EXTRBLE.      TOTAL        TOTAL        TOTAL        TOTAL       TOTAL

                 SUBM      ZN           FE           AL           MN           NI           MO           CO           AS
                  ID      MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)            9(0)         9(0)         9(1)         9(0)         9(0)         8(7)         9(7)         7(0)
           LOW            .003          .19        L.020         .044         .006        L.001        L.001        .0012
          HIGH            .036         2.74        1.140         .196         .023         .006         .004        .0040
       AVERAGE            .020         1.10         .272*        .094         .013         .002*        .002*       .0024
      STD.DEV.            .013         1.00         .363*        .056         .006         .002*        .001*       .0010
  PERCNT:10TH
          25TH            .009          .44         .055         .052         .008        L.001        L.001        .0016
   MEDIAN 50TH            .018          .53         .130         .066         .014        L.001        L.001        .0024
          75TH            .032         2.02         .405         .141         .016        L.001        L.001        .0035
          90TH
SECONDARY CODE

                         04304L       48009L       24009L       82302L       82009L       80015L       34005L       23009L
                        BERYLLIUM     CADMIUM     CHROMIUM       LEAD         LEAD       MERCURY     SELENIUM     VANADIUM
                        EXTRBLE.      TOTAL        TOTAL       EXTRBLE.      TOTAL        TOTAL      TOTAL         TOTAL

                 SUBM      BE           CD           CR           PB           PB           HG           SE           V
                  ID      MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)            9(8)         9(7)         9(3)         8(5)                      9(9)         7(7)         9(1)
           LOW           L.001        L.001        L.001        L.003                    L.0001       L.0002        L.002
          HIGH          60.001         .003         .027         .015                    L.0001       L.0002         .013
       AVERAGE           6.668*        .001*        .006*        .005*                                               .006*
      STD.DEV.          20.000*        .001*        .008*        .004*                                               .004*
  PERCNT:10TH
          25TH           L.001        L.001        L.001        L.003                    L.0001       L.0002         .003
   MEDIAN 50TH           L.001        L.001         .004        L.003                    L.0001       L.0002         .005
          75TH           L.001        L.001         .005         .006                    L.0001       L.0002         .009
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  13                    NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                      SURFACE WATER DATA
STATION 00AL05EB2121    LAT. 53D 31M 44S  LONG. 113D 29M 37S   PR 3   UTM 12 334750E 5933800N  FOR MAY 19, 1982 TO NOV 02, 1982
 NORTH SASKATCHEWAN RIVER -  LEFT BANK     90M UPSTREAM OF ROSSDALE PLANT

                          97251F       02065F       08102F       02042F       02041L       10301L       08202L       08301L
                         DEPTH OF    TEMPERATURE    OXYGEN      SPECIFIC     SPECIFIC        PH         OXYGEN       OXYGEN
                         SAMPLING       WATER      DISSOLVED    CONDUCT.     CONDUCT.                  BIOCHEM.    TOTAL COD
                                                                                                      DEMAND-BOD
                                                      O2                                                  O2           O2
                  SUBM  FROM SURF.                   MG/L                                                MG/L         MG/L
                   ID       M         DEG.C                     USIE/CM      US/CM       PH UNITS
SAMPLES(FLAGS)           12(0)        12(0)        12(0)        11(0)        12(0)        12(0)        12(0)        12(0)
           LOW             1.2          1.            8.5         295.         263.          8.0           .5          6.1
          HIGH             4.3         20.           15.          410.         347.          8.6          3.          26.
       AVERAGE             2.2         14.1          10.4         353.         316.                       1.4         11.7
     STD.DEV.               .8          6.4           2.2          38.          24.                        .8          5.8
   PERCNT:10TH             1.6          4.5           8.6         310.         289.          8.2           .8          6.9
          25TH             1.8          9.9           8.7         315.         301.          8.3           .8          8.4
   MEDIAN 50TH             2.1         16.3           9.3         355.         322.          8.4          1.1          9.3
          75TH             2.4         18.8          11.9         385.         335.          8.4          2.2         14.5
          90TH             2.7         19.5          13.4         390.         336.          8.5          2.2         18.
SECONDARY CODE

                          06536L       06005L       06154L       06107L       06905L       06715L       06721L       10151L
                         PHENOLIC      CARBON       CARBON       CARBON       CARBON      CHLORO -    CHLOROPHYLL   ALKALINITY
                         MATERIAL      TOTAL      DISSOLVED    DISSOLVED   PARTICULATE    PHYLL A        -A-         PHENOL
                          PHENOL      ORGANIC     INORGANIC     ORGANIC       TOTAL                   EPILITHON    PHTHALEIN
                  SUBM                   C            C            C            C                                   CACO3
                   ID     MG/L         MG/L         MG/L         MG/L         MG/L         MG/M3        MG/M2        MG/L
SAMPLES(FLAGS)           12(7)        11(0)         4(0)         4(0)         4(0)                                  12(8)
           LOW           L.002          4.4          2.           1.7          .13                                   .0
          HIGH            .003         13.          30.1          4.          1.99                                  L4.2
       AVERAGE            .002*         8.4         19.4          3.2          .96                                  2.8*
      STD.DEV.            .000*         2.7         13.5          1.0          .78                                  2.1*
   PERCNT:10TH           L.002          5.                                                                            .0
          25TH           L.002          6.8          8.8          2.5          .42                                   .0
   MEDIAN 50TH           L.002          7.5         22.8          3.5          .86                                  L4.2
          75TH            .002         11.          30.0          3.9         1.50                                  L4.2
          90TH            .003         11.                                                                          L4.2
SECONDARY CODE

                          10101L       06301L       06201L       17203L       16306L       09107L       14102L       10602L
                        ALKALINITY    CARBONATE    BICARBONT.    CHLORIDE     SULPHATE     FLUORIDE     SILICA      HARDNESS
                          TOTAL       (CALCD.)      (CALCD.)    DISSOLVED    DISSOLVED    DISSOLVED    REACTIVE       TOTAL
                                                                                                                  (CALCD.)
                  SUBM    CACO3         CO3         HCO3          CL          SO4           F           SIO2        CACO3
                   ID     MG/L         MG/L        MG/L          MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)           12(0)        12(8)        12(8)        11(10)       12(0)        12(0)        12(0)        12(0)
           LOW            113.          0.         Q128.         L0.          15.          .10          3.0         113.
          HIGH            148.         Q5.          177.          2.          40.          .17          5.6         169.
       AVERAGE            132.          3.*         154.*        1.1*         32.          .13          4.1         145.
      STD.DEV.             11.          2.*          14.*         .3*          7.          .02           .7          14.
   PERCNT:10TH            116.          0.          141.         L0.          25.          .12          3.2         136.
          25TH            127.          0.          145.         L0.          30.          .13          3.7         137.
   MEDIAN 50TH            132.          5.          155.         L0.          33.          .13          3.9         144.
          75TH            141.          5.          164.         L0.          35.          .14          4.5         155.
          90TH            145.         Q5.         Q170.         L0.          40.          .15          5.0         160.
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  14                            NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                               SURFACE WATER DATA
STATION 00AL05EB2121    LAT. 53D 31M 44S  LONG. 113D 29M 37S   PR 3   UTM 12 334750E 5933800N  FOR MAY 19, 1982 TO NOV 02, 1982
 NORTH SASKATCHEWAN RIVER -  LEFT BANK      90M UPSTREAM OF ROSSDALE PLANT


                            20110L       12102L        11103L       19103L       15406L       15419L       07403L       07602L
                           CALCIUM     MAGNESIUM      SODIUM      POTASSIUM   PHOSPHOROUS   PHOSPHORUS    NITROGEN     NITROGEN
                          DISSOLVED    DISSOLVED     DISSOLVED    DISSOLVED      TOTAL        TOTAL      TOTAL ORG.     TOTAL
                                                                              PHOSPHATE    PHOSPHATE     (CALCD.)     (CALCD.)
                  SUBM        CA           MG            NA           K            P            P            N            N
                   ID       MG/L         MG/L          MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)              12(0)        12(0)         12(0)        12(0)        10(0)                     12(12)       12(12)
           LOW                32.           8.            2.           .5         .012                     Q.100        Q.550
          HIGH                48.          12.            7.          1.0         .117                     Q.200        Q.650
       AVERAGE                41.         10.6           4.5           .8         .042
      STD.DEV.                 4.          1.2           1.4           .1         .042
   PERCNT:10TH                38.          10.            3.           .7         .012                     Q.100        Q.550
          25TH                38.         10.0           3.5           .8         .015                      .100         .550
   MEDIAN 50TH                40.         10.0           4.5           .9         .019                      .100         .550
          75TH                44.         12.0           5.5           .9         .065                      .100         .550
          90TH                46.          12.            6.           .9         .117                     Q.100        Q.550
SECONDARY CODE

                            07021L       07503L        07562L       07205L       07206L       07105L       07906L       10407L
                           NITROGEN     NITROGEN      NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN     RESIDUE
                            TOTAL        TOTAL       DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED   PARTICULATE NONFILTRABLE
                           KJELDAHL     AMMONIA       AMMONIA      NITRITE      NITRITE     NO3 & NO2      TOTAL
                  SUBM        N            N             N            N            N            N            N
                   ID       MG/L         MG/L          MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)              12(9)        12(12)                     12(12)       12(12)       12(12)        4(1)         5(0)
           LOW               L.5          L.4                        L.05        L.007         L.05         L.01           6.
          HIGH                .6          L.4                        L.05        L.007         L.05          .11          22.
       AVERAGE              .508*                                                                          .058*          13.
      STD.DEV.              .029*                                                                          .050*           8.
   PERCNT:10TH               L.5          L.4                        L.05        L.007         L.05
          25TH             L.500         L.40                       L.050        L.007        L.050        .015*           7.
   MEDIAN 50TH             L.500         L.40                       L.050        L.007        L.050         .055          11.
          75TH              .500*        L.40                       L.050        L.007        L.050         .100          21.
          90TH                .5          L.4                        L.05        L.007         L.05
SECONDARY CODE           01L

                            10474L       10453L        00205L       36001L       36011L       36102L       36910L       29009L
                           RESIDUE      RESIDUE        TOTAL      COLIFORMS    COLIFORMS     STREP.     STD. PLATE     COPPER
                            TOTAL      FILTRABLE     DISSOLVED      TOTAL        FECAL        FECAL        COUNT        TOTAL
                                                      SOLIDS                                            BACT.DENS.
                  SUBM                                               MPN          MPN          MF                        CU
                   ID       MG/L         MG/L          MG/L       NO/100ML     NO/100ML     NO/100ML       NO/ML        MG/L
SAMPLES(FLAGS)               5(0)         5(0)         12(0)        12(0)        12(0)        12(0)        11(0)        12(4)
           LOW               222.         200.          128.         160.          10.          20.          26.        L.001
          HIGH               286.         280.          192.        5500.        1000.         370.        8400.         .007
       AVERAGE               247.         234.          169.        1240.         172.         114.        1438.        .003*
      STD.DEV.                28.          34.           17.        1672.         284.         116.        2756.        .002*
   PERCNT:10TH                                          156.         160.          24.          30.          40.        L.001
          25TH               231.         210.          160.         195.          27.          44.          67.        L.001
   MEDIAN 50TH               231.         220.          169.         350.          52.          65.         210.         .003
          75TH               267.         260.          182.        1850.         200.         120.         700.         .005
          90TH                                          185.        3300.         350.         330.        5200.         .006
SECONDARY CODE                                                       02L          12L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  15                      NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                        SURFACE WATER DATA
STATION 00AL05EB2121    LAT. 53D 31M 44S  LONG. 113D 29M 37S   PR 3   UTM 12 334750E 5933800N  FOR MAY 19, 1982 TO NOV 02, 1982
 NORTH SASKATCHEWAN RIVER -  LEFT BANK     90M UPSTREAM OF ROSSDALE PLANT

                           30009L      26304L      13306L      25003L      28009L      42009L      27009L      33005L
                            ZINC        IRON      ALUMINUM    MANGANESE    NICKEL    MOLYBDENUM    COBALT      ARSENIC
                           TOTAL      EXTRBLE.    EXTRBLE.     TOTAL       TOTAL       TOTAL       TOTAL      TOTAL

                    SUBM     ZN          FE          AL          MN          NI          MO          CO          AS
                     ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)              12(1)       12(0)       8(0)        9(1)        12(0)       8(8)        12(10)      7(0)
           LOW              L.001         .04        .157       L.008        .003       L.001       L.001       .0003
          HIGH               .042        1.27       3.470        .106        .012       L.001        .005       .0010
       AVERAGE               .025*        .37        .929        .029*       .005                    .001*      .0006
      STD.DEV.               .014*        .38       1.084        .032*       .003                    .001*      .0003
   PERCNT:10TH               .006         .12                                .003                   L.001
          25TH               .014         .17        .382        .010        .004       L.001       L.001       .0003
   MEDIAN 50TH               .029         .24        .508        .015        .005       L.001       L.001       .0004
          75TH               .036         .36       1.014        .040        .006       L.001       L.001       .0008
          90TH               .040        1.02                                .010                    .003
SECONDARY CODE

                           04304L      48009L      24009L      82302L      82009L      80015L      34005L      23009L
                          BERYLLIUM    CADMIUM    CHROMIUM      LEAD        LEAD       MERCURY    SELENIUM    VANADIUM
                           EXTRBLE.     TOTAL       TOTAL      EXTRBLE.     TOTAL       TOTAL     TOTAL        TOTAL

                    SUBM     BE          CD          CR          PB          PB          HG          SE          V
                     ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)              8(8)        12(8)       12(0)                   12(8)                   7(5)        8(3)
           LOW              L.001       L.001        .003                   L.003                  L.0002       L.002
          HIGH              L.001        .002        .053                    .018                   .0007        .012
       AVERAGE                           .001*       .010                    .005*                  .0003*       .004*
      STD.DEV.                           .000*       .014                    .005*                  .0002*       .003*
   PERCNT:10TH                          L.001        .003                   L.003
          25TH              L.001       L.001        .003                   L.003                  L.0002       L.002
   MEDIAN 50TH              L.001       L.001        .006                   L.003                  L.0002        .003
          75TH              L.001        .002        .009                    .005                   .0003        .005
          90TH                           .002        .016                    .012
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  16                          NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                              SURFACE WATER DATA
STATION 00AL05EB2122    LAT. 53D 31M 41S  LONG. 113D 29M 37S   PR 3   UTM 12 334700E 5933700N  FOR MAY 19, 1982 TO NOV 02, 1982
 NORTH SASKATCHEWAN RIVER  -    CENTRE       90M UPSTREAM OF ROSSDALE PLANT

                           97251F          02065F          08102F          02042F          02041L          10301L          08202L          08301L
                          DEPTH OF       TEMPERATURE       OXYGEN         SPECIFIC        SPECIFIC           PH            OXYGEN          OXYGEN
                          SAMPLING          WATER         DISSOLVED       CONDUCT.        CONDUCT.                        BIOCHEM.        TOTAL COD
                                                                                                                        DEMAND-BOD
                  SUBM   FROM SURF.                          02                                                            02              02
                   ID        M             DEG.C            MG/L          USIE/CM          US/CM          PH UNITS         MG/L            MG/L
SAMPLES(FLAGS)             12(0)           12(0)           12(0)           12(0)           12(0)           12(0)           12(1)           12(0)
           LOW               1.8              1.             7.8            290.            261.             7.9             L.3             6.1
          HIGH               4.3             20.            14.5            405.            342.             8.5             2.7             26.
       AVERAGE               2.5            14.0            10.0            345.            313.                            1.2*            12.2
      STD.DEV.                .7             6.3             2.0             38.             23.                             .7*             6.5
  PERCNT:10TH                 2.             4.5             8.3            300.            287.             8.2              .4              7.
          25TH               2.0            10.0             8.6            308.            301.             8.3              .6             8.1
   MEDIAN 50TH               2.2            16.0             9.0            348.            316.             8.4             1.0             9.3
          75TH               3.0            18.7            11.4            380.            332.             8.4             1.7            15.5
          90TH                3.            19.            12.4            385.            335.             8.5              2.             23.
SECONDARY CODE

                           06536L          06005L          06154L          06107L          06905L          06715L          06721L          10151L
                          PHENOLIC         CARBON          CARBON          CARBON          CARBON         CHLORO -       CHLOROPHYLL     ALKALINITY
                          MATERIAL          TOTAL         DISSOLVED       DISSOLVED      PARTICULATE       PHYLL A           -A-            PHENOL
                           PHENOL          ORGANIC        INORGANIC        ORGANIC          TOTAL                         EPILITHON       PHTHALEIN
                  SUBM                        C               C               C               C                                             CACO3
                   ID       MG/L            MG/L            MG/L            MG/L            MG/L            MG/M3           MG/M2           MG/L
SAMPLES(FLAGS)             12(7)           10(0)                                                                                          12(8)
           LOW              L.002            4.7                                                                                             .0
          HIGH               .009            10.                                                                                           L4.2
       AVERAGE               .003*           7.6                                                                                           2.8*
      STD.DEV.               .002*           1.9                                                                                           2.1*
  PERCNT:10TH               L.002            5.0                                                                                             .0
          25TH              L.002            6.3                                                                                             .0
   MEDIAN 50TH              L.002            7.3                                                                                           L4.2
          75TH               .003            9.2                                                                                           L4.2
          90TH               .003           10.0                                                                                           L4.2
SECONDARY CODE

                           10101L          06301L          06201L          17203L          16306L          09107L          14102L          10602L
                         ALKALINITY       CARBONATE       BICARBONT.       CHLORIDE        SULPHATE        FLUORIDE         SILICA         HARDNESS
                           TOTAL          (CALCD.)         (CALCD.)       DISSOLVED       DISSOLVED       DISSOLVED       REACTIVE          TOTAL
                                                                                                                                          (CALCD.)
                  SUBM      CACO3            CO3            HCO3              CL             SO4              F              SIO2           CACO3
                   ID       MG/L            MG/L            MG/L             MG/L            MG/L            MG/L            MG/L           MG/L
SAMPLES(FLAGS)             12(0)           12(8)           12(8)           12(12)          12(0)           12(0)           12(0)           12(0)
           LOW              113.              0.           Q131.             L0.             20.             .12             3.2            120.
          HIGH              148.             Q5.           Q170.             L0.             40.             .15             5.5            167.
       AVERAGE              132.             3.*           154.*                             32.             .13             4.1            146.
      STD.DEV.               11.             2.*            12.*                              7.             .01              .7             13.
  PERCNT:10TH               116.              0.            138.             L0.             25.             .12             3.2            136.
          25TH              126.              0.            145.            L1.0             27.             .12             3.7            138.
   MEDIAN 50TH              131.              5.            155.            L1.0             30.             .12             4.1            144.
          75TH              140.              5.            163.            L1.0             38.             .14             4.5            156.
          90TH              145.             Q5.           Q167.             L0.             40.             .14             5.0            159.
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

REQUEST 0004 - 0006 PAGE 17

NAQUADAT SUMMARY REPORT APR 30, 1986
SURFACE WATER DATA

STATION 00AL05EB2122 LAT. 53D 31M 41S LONG. 113D 29M 37S PR 3 UTM 12 334700E 5933700N FOR MAY 19, 1982 TO NOV 02, 1982
NORTH SASKATCHEWAN RIVER - CENTRE 90M UPSTREAM OF ROSSDALE PLANT

	20110L CALCIUM DISSOLVED	12102L MAGNESIUM DISSOLVED	11103L SODIUM DISSOLVED	19103L POTASSIUM DISSOLVED	15406L PHOSPHOROUS TOTAL PHOSPHATE	15419L PHOSPHORUS TOTAL PHOSPHATE	07403L NITROGEN TOTAL ORG. (CALCD.)	07602L NITROGEN TOTAL (CALCD.)
SUBM	CA	MG	NA	K	P	P	N	N
ID	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
SAMPLES(FLAGS)	12(0)	12(0)	12(0)	12(0)	10(0)	5(0)	12(12)	12(12)
LOW	35.	8.	2.	.5	.008	.012	Q.100	Q.550
HIGH	47.	13.	5.	1.0	.107	.041	Q.200	Q.650
AVERAGE	41.	10.6	4.1	.8	.037	.020		
STD.DEV.	4.	1.3	.9	.1	.038	.012		
PERCNT:10TH	37.	10.	3.	.7	.010		Q.100	Q.550
25TH	39.	10.0	4.0	.8	.012	.012	.100	.550
MEDIAN 50TH	41.	10.0	4.0	.8	.016	.017	.100	.550
75TH	44.	11.5	5.0	.9	.046	.017	.100	.550
90TH	47.	12.	5.	.9	.104		Q.100	Q.550
SECONDARY CODE						21L		

	07021L NITROGEN TOTAL KJELDAHL	07503L NITROGEN TOTAL AMMONIA	07562L NITROGEN DISSOLVED AMMONIA	07205L NITROGEN DISSOLVED NITRITE	07206L NITROGEN DISSOLVED NITRITE	07105L NITROGEN DISSOLVED NO3 & NO2	07906L NITROGEN PARTICULATE TOTAL	10407L RESIDUE NONFILTRABLE
SUBM	N	N	N	N	N	N	N	
ID	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
SAMPLES(FLAGS)	12(5)	12(12)	5(0)	12(12)	12(12)	12(12)		5(0)
LOW	.100	L.4	.005	L.05	L.007	L.05		5.
HIGH	.6	L.4	.099	L.05	L.007	L.05		16.
AVERAGE	.363*		.025					10.
STD.DEV.	.193*		.041					6.
PERCNT:10TH	.110	L.4		L.05	L.007	L.05		
25TH	.145	L.40	.005	L.050	L.007	L.050		5.
MEDIAN 50TH	L.500	L.40	.007	L.050	L.007	L.050		10.
75TH	L.500	L.40	.009	L.050	L.007	L.050		16.
90TH	.5	L.4		L.05	L.007	L.05		
SECONDARY CODE	01L							

	10474L RESIDUE TOTAL	10453L RESIDUE FILTRABLE	00205L TOTAL DISSOLVED SOLIDS	36001L COLIFORMS TOTAL	36011L COLIFORMS FECAL	36102L STREP. FECAL	36910L STD. PLATE COUNT BACT.DENS.	29009L COPPER TOTAL
SUBM				MPN	MPN	MF		CU
ID	MG/L	MG/L	MG/L	NO/100ML	NO/100ML	NO/100ML	NO/ML	MG/L
SAMPLES(FLAGS)	5(0)	5(0)	12(0)	12(0)	12(0)	12(0)	11(0)	12(4)
LOW	250.	240.	137.	30.	2.	4.	24.	L.001
HIGH	276.	270.	183.	540.	46.	270.	720.	.011
AVERAGE	264.	254.	165.	134.	18.	64.	199.	.004*
STD.DEV.	11.	13.	14.	151.	12.	77.	226.	.003*
PERCNT:10TH			149.	36.	4.	4.	27.	L.001
25TH	256.	240.	157.	42.	10.	12.	40.	L.001
MEDIAN 50TH	265.	260.	166.	70.	16.	37.	80.	.003
75TH	275.	260.	179.	175.	22.	85.	340.	.005
90TH			183.	280.	32.	140.	480.	.008
SECONDARY CODE				02L	12L			

* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q

```
REQUEST 0007 -  0009 PAGE  18                     NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                      SURFACE WATER DATA
STATION 00AL05EB2122    LAT. 53D 31M 41S  LONG. 113D 29M 37S   PR 3   UTM 12 334700E 5933700N  FOR MAY 19, 1982 TO NOV 02, 1982
 NORTH SASKATCHEWAN RIVER  -   CENTRE      90M UPSTREAM OF ROSSDALE PLANT

                          30009L      26304L      13306L      25003L      28009L      42009L      27009L      33005L
                           ZINC        IRON      ALUMINUM   MANGANESE     NICKEL    MOLYBDENUM    COBALT     ARSENIC
                          TOTAL      EXTRBLE.    EXTRBLE.     TOTAL       TOTAL       TOTAL       TOTAL      TOTAL

                 SUBM      ZN          FE          AL          MN          NI          MO          CO          AS
                  ID      MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            12(1)       12(0)        8(0)        9(2)       12(1)        8(8)       12(11)       7(1)
           LOW            L.001         .04        .151       L.008       L.001       L.001       L.001      L.0002
          HIGH             .156        1.23       3.170        .099        .073       L.001        .006       .0012
       AVERAGE             .034*        .35        .900        .027*       .011*                   .001*      .0005*
      STD.DEV.             .040*        .35       1.014        .030*       .020*                   .001*      .0004*
   PERCNT:10TH             .013         .13                                .003                   L.001
          25TH             .020         .17        .276        .009        .004       L.001       L.001       .0003
    MEDIAN 50TH            .023         .22        .546        .011        .005       L.001       L.001       .0003
          75TH             .034         .39       1.119        .037        .007       L.001       L.001       .0008
          90TH             .038         .87                                .018                   L.001
SECONDARY CODE
                          04304L      48009L      24009L      82302L      82009L      80015L      34005L      23009L
                        BERYLLIUM    CADMIUM     CHROMIUM      LEAD        LEAD      MERCURY    SELENIUM    VANADIUM
                         EXTRBLE.     TOTAL       TOTAL      EXTRBLE.     TOTAL       TOTAL      TOTAL       TOTAL

                 SUBM      BE          CD          CR          PB          PB          HG          SE          V
                  ID      MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)             8(8)       12(10)      12(2)                   12(8)                    7(7)        8(3)
           LOW            L.001       L.001       L.001                   L.003                   L.0002      L.002
          HIGH            L.001        .011        .018                    .090                   L.0002       .010
       AVERAGE                         .002*       .006*                   .011*                               .004*
      STD.DEV.                         .003*       .005*                   .025*                               .003*
   PERCNT:10TH                        L.001       L.001                   L.003
          25TH            L.001       L.001        .003                   L.003                   L.0002      L.002
    MEDIAN 50TH           L.001       L.001        .006                   L.003                   L.0002       .003
          75TH            L.001       L.001        .009                    .005                   L.0002       .004
          90TH                         .002        .011                    .006
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  19                        NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                          SURFACE WATER DATA
STATION 00AL05EB2123    LAT. 53D 31M 39S  LONG. 113D 29M 37S   PR 3   UTM 12 334700E 5933650N  FOR MAY 19, 1982 TO NOV 02, 1982
 NORTH SASKATCHEWAN RIVER   RIGHT BANK      90M UPSTREAM OF ROSSDALE PLANT

                           97251F       02065F       08102F       02042F       02041L       10301L       08202L       08301L
                          DEPTH OF    TEMPERATURE    OXYGEN      SPECIFIC     SPECIFIC        PH         OXYGEN       OXYGEN
                          SAMPLING       WATER      DISSOLVED    CONDUCT.     CONDUCT.                  BIOCHEM.    TOTAL COD
                                                                                                       DEMAND-BOD
                   SUBM  FROM SURF.                    02                                                  02           02
                    ID       M          DEG.C         MG/L       USIE/CM       US/CM       PH UNITS       MG/L         MG/L
SAMPLES(FLAGS)             12(0)        12(0)        12(0)        12(0)        12(0)        12(0)        12(1)        12(0)
           LOW                .6           .5          7.7         290.         268.          8.1          L.3          6.5
          HIGH               3.4          20.         14.6         405.         343.          8.5           3.          25.
       AVERAGE               1.5         14.0         10.0         349.         318.                       1.2*         13.1
      STD.DEV.                .7          6.4          2.1          39.          23.                        .8*          5.7
  PERCNT:10TH                 .9          4.5          8.3         300.         288.          8.2           .4          7.4
          25TH               1.0         10.1          8.5         314.         307.          8.3           .5          9.4
   MEDIAN 50TH               1.3         16.3          9.1         355.         324.          8.4          1.0         12.0
          75TH               1.8         18.6         11.5         385.         337.          8.4          1.7         16.5
          90TH               2.1         19.5         12.4         390.         340.          8.4          2.2          20.
SECONDARY CODE
                           06536L       06005L       06154L       06107L       06905L       06715L       06721L       10151L
                          PHENOLIC      CARBON       CARBON       CARBON       CARBON      CHLORO -   CHLOROPHYLL  ALKALINITY
                          MATERIAL       TOTAL      DISSOLVED    DISSOLVED  PARTICULATE    PHYLL A        -A-         PHENOL
                           PHENOL       ORGANIC     INORGANIC     ORGANIC      TOTAL                   EPILITHON    PHTHALEIN
                   SUBM                    C            C            C            C                                  CACO3
                    ID      MG/L         MG/L         MG/L         MG/L         MG/L         MG/M3        MG/M2        MG/L
SAMPLES(FLAGS)             12(7)        11(0)         4(1)         4(0)         4(0)                                12(9)
           LOW             L.002          5.6          L0.          1.6          .08                                   .0
          HIGH              .007         11.0         35.4           4.         2.18                                 L4.2
       AVERAGE              .003*         8.3         24.1*         2.9          .99                                 3.1*
      STD.DEV.              .001*         1.7         15.6*         1.2          .88                                 1.9*
  PERCNT:10TH              L.002           7.                                                                          0.
          25TH             L.002           7.         15.5*         1.9          .42                                 2.1*
   MEDIAN 50TH             L.002           8.         30.0          3.1          .84                                 L4.2
          75TH              .003          10.         32.7          4.0         1.55                                 L4.2
          90TH              .005          11.                                                                        L4.2
SECONDARY CODE
                           10101L       06301L       06201L       17203L       16306L       09107L       14102L       10602L
                         ALKALINITY   CARBONATE    BICARBONT.    CHLORIDE     SULPHATE     FLUORIDE      SILICA      HARDNESS
                            TOTAL      (CALCD.)      (CALCD.)    DISSOLVED    DISSOLVED    DISSOLVED    REACTIVE       TOTAL
                                                                                                                    (CALCD.)
                   SUBM     CACO3         CO3         HCO3          CL           SO4           F           SIO2        CACO3
                    ID      MG/L         MG/L        MG/L          MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)             12(0)        12(9)        12(9)       12(11)        12(0)        12(0)        12(0)        12(0)
           LOW              114.           0.        Q131.          L0.          15.          .11          3.0         118.
          HIGH              146.          Q5.        Q168.           2.          40.          .15          5.7         158.
       AVERAGE              132.           4.*       153.*         1.1*          30.          .13          4.0         143.
      STD.DEV.               11.           2.*        12.*          .3*           7.          .01           .8          12.
  PERCNT:10TH               116.           0.         139.          L0.          25.          .12          3.0         134.
          25TH              127.           3.         144.        L1.0           28.          .12          3.6         137.
   MEDIAN 50TH              132.           5.         156.        L1.0           30.          .13          3.9         141.
          75TH              141.           5.         164.        L1.0           33.          .14          4.4         157.
          90TH              146.          Q5.        Q168.          L0.          40.          .14          5.2         158.
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

NAQUADAT SUMMARY REPORT APR 30, 1986
SURFACE WATER DATA

STATION 00AL05EB2123 LAT. 53D 31M 39S LONG. 113D 29M 37S PR 3 UTM 12 334700E 5933650N FOR MAY 19, 1982 TO NOV 02, 1982
NORTH SASKATCHEWAN RIVER RIGHT BANK 90M UPSTREAM OF ROSSDALE PLANT

SUBM ID	20110L CALCIUM DISSOLVED CA MG/L	12102L MAGNESIUM DISSOLVED MG MG/L	11103L SODIUM DISSOLVED NA MG/L	19103L POTASSIUM DISSOLVED K MG/L	15406L PHOSPHOROUS TOTAL PHOSPHATE P MG/L	15419L PHOSPHORUS TOTAL PHOSPHATE P MG/L	07403L NITROGEN TOTAL ORG. (CALCD.) N MG/L	07602L NITROGEN TOTAL (CALCD.) N MG/L
SAMPLES(FLAGS)	12(0)	12(0)	12(0)	12(0)	10(0)		12(12)	12(12)
LOW	34.	8.	2.	.5	.011		Q.100	Q.550
HIGH	46.	11.	6.	1.3	.13		Q.300	Q.750
AVERAGE	41.	10.2	4.6	.9	.044			
STD.DEV.	4.	.9	1.4	.2	.039			
PERCNT:10TH	37.	9.	3.	.7	.013		Q.100	Q.550
25TH	38.	10.0	3.5	.8	.017		.100	.550
MEDIAN 50TH	40.	10.0	5.0	.9	.022		.100	.550
75TH	45.	11.0	6.0	1.0	.059		.150	.600
90TH	45.	11.	6.	1.1	.107		Q.200	Q.650
SECONDARY CODE								

SUBM ID	07021L NITROGEN TOTAL KJELDAHL N MG/L	07503L NITROGEN TOTAL AMMONIA N MG/L	07562L NITROGEN DISSOLVED AMMONIA N MG/L	07205L NITROGEN DISSOLVED NITRITE N MG/L	07206L NITROGEN DISSOLVED NITRITE N MG/L	07105L NITROGEN DISSOLVED NO3 & NO2 N MG/L	07906L NITROGEN PARTICULATE TOTAL N MG/L	10407L RESIDUE NONFILTRABLE MG/L
SAMPLES(FLAGS)	12(8)	12(12)		12(12)	12(12)	12(12)	4(1)	5(0)
LOW	L.5	L.4		L.05	L.007	L.05	L.01	5.
HIGH	.7	L.4		L.05	L.007	L.05	.11	20.
AVERAGE	.533*						.048*	14.
STD.DEV.	.065*						.045*	6.
PERCNT:10TH	L.5	L.4		L.05	L.007	L.05		
25TH	L.500	L.40		L.050	L.007	L.050	.015*	13.
MEDIAN 50TH	L.500	L.40		L.050	L.007	L.050	.035	14.
75TH	.550	L.40		L.050	L.007	L.050	.080	18.
90TH	.6	L.4		L.05	L.007	L.05		
SECONDARY CODE	01L							

SUBM ID	10474L RESIDUE TOTAL MG/L	10453L RESIDUE FILTRABLE MG/L	00205L TOTAL DISSOLVED SOLIDS MG/L	36001L COLIFORMS TOTAL MPN NO/100ML	36011L COLIFORMS FECAL MPN NO/100ML	36102L STREP. FECAL MF NO/100ML	36910L STD. PLATE COUNT BACT.DENS. NO/ML	29009L COPPER TOTAL CU MG/L
SAMPLES(FLAGS)	5(0)	5(0)	12(0)	12(0)	12(0)	12(0)	11(0)	12(3)
LOW	215.	210.	132.	36.	10.	10.	22.	L.001
HIGH	310.	290.	185.	2400.	170.	210.	6300.	.006
AVERAGE	270.	256.	167.	550.	66.	77.	928.	.003*
STD.DEV.	35.	30.	15.	636.	44.	62.	1854.	.002*
PERCNT:10TH			157.	170.	22.	18.	35.	L.001
25TH	264.	250.	159.	255.	31.	24.	120.	.001*
MEDIAN 50TH	278.	260.	167.	315.	66.	65.	200.	.002
75TH	283.	270.	181.	585.	85.	100.	770.	.004
90TH			182.	1000.	110.	170.	1800.	.006
SECONDARY CODE				02L	12L			

* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q

```
REQUEST 0007 -  0009 PAGE  21                        NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                        SURFACE WATER DATA
STATION 00AL05EB2123    LAT. 53D 31M 39S  LONG. 113D 29M 37S   PR 3   UTM 12 334700E 5933650N  FOR MAY 19, 1982 TO NOV 02, 1982
 NORTH SASKATCHEWAN RIVER   RIGHT BANK     90M UPSTREAM OF ROSSDALE PLANT

                         30009L      26304L      13306L      25003L      28009L      42009L      27009L      33005L
                          ZINC        IRON      ALUMINUM   MANGANESE     NICKEL    MOLYBDENUM    COBALT     ARSENIC
                         TOTAL      EXTRBLE.    EXTRBLE.     TOTAL       TOTAL       TOTAL       TOTAL      TOTAL

                  SUBM     ZN          FE          AL          MN          NI          MO          CO          AS
                   ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           12(0)       12(0)        8(0)        9(1)       12(1)        8(7)       12(10)       7(1)
           LOW            .014         .03        .251       L.008       L.001       L.001       L.001      L.0002
          HIGH            .045        1.24       3.700        .121        .014        .004        .006       .0013
       AVERAGE            .030         .37        .897        .031*       .006*       .001*       .002*      .0005*
      STD.DEV.            .010         .36       1.187        .037*       .004*       .001*       .002*      .0004*
   PERCNT:10TH            .017         .10                                .003                    L.001
          25TH            .021         .14        .313        .010        .003       L.001       L.001       .0003
   MEDIAN 50TH            .031         .24        .379        .015        .005       L.001       L.001       .0004
          75TH            .037         .44        .920        .039        .008       L.001       L.001       .0004
          90TH            .042         .93                                .011                     .003
SECONDARY CODE

                         04304L      48009L      24009L      82302L      82009L      80015L      34005L      23009L
                       BERYLLIUM    CADMIUM     CHROMIUM      LEAD        LEAD      MERCURY     SELENIUM    VANADIUM
                        EXTRBLE.     TOTAL       TOTAL      EXTRBLE.      TOTAL       TOTAL      TOTAL        TOTAL

                  SUBM     BE          CD          CR          PB          PB          HG          SE          V
                   ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            8(8)       12(9)       12(3)                   12(8)                    7(5)        8(3)
           LOW           L.001       L.001       L.001                   L.003                  L.0002       L.002
          HIGH           L.001        .002        .014                    .038                   .0007        .013
       AVERAGE                        .001*       .005*                   .006*                  .0003*       .004*
      STD.DEV.                        .000*       .004*                   .010*                  .0002*       .004*
   PERCNT:10TH                       L.001       L.001                   L.003
          25TH           L.001       L.001        .002*                  L.003                  L.0002       L.002
   MEDIAN 50TH           L.001       L.001        .004                   L.003                  L.0002        .003
          75TH           L.001        .001*       .007                    .005                   .0003        .004
          90TH                        .002        .011                    .006
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  22                     NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                        SURFACE WATER DATA
STATION 00AL05EB2140    LAT. 53D 31M 43S  LONG. 113D 29M 26S   PR 3   UTM 12 334900E 5933750N  FOR MAY 17, 1983 TO AUG 03, 1983
MILLCREEK AT MOUTH

                         97251F        02065F        08102F        02042F        02041L        10301L        08202L        08301L
                        DEPTH OF     TEMPERATURE     OXYGEN       SPECIFIC      SPECIFIC         PH          OXYGEN        OXYGEN
                        SAMPLING        WATER       DISSOLVED     CONDUCT.      CONDUCT.                    BIOCHEM.     TOTAL COD
                                                                                                          DEMAND-BOD
                 SUBM  FROM SURF.                      02                                                     02            02
                  ID       M           DEG.C          MG/L        USIE/CM        US/CM       PH UNITS        MG/L          MG/L
SAMPLES(FLAGS)                          3(0)          3(0)          3(0)          4(0)          4(0)          4(0)          4(0)
           LOW                          17.0           5.4          450.          481.           7.0           4.5          84.8
          HIGH                          20.5           9.4          925.         1559.           8.6           8.0         113.0
       AVERAGE                          19.2           6.8          632.          869.                         5.7          96.3
      STD.DEV.                           1.9           2.3          256.          493.                         1.6          12.8
  PERCNT:10TH
          25TH                                                                    516.           7.3           4.7          86.3
   MEDIAN 50TH                          20.            5.6          520.          717.           7.7           5.2          93.8
          75TH                                                                   1222.           8.2           6.8         106.3
          90TH
SECONDARY CODE                                                                                                             04L

                         06536L        06005L        06154L        06107L        06905L        06715L        06721L        10151L
                        PHENOLIC       CARBON        CARBON        CARBON        CARBON       CHLORO -    CHLOROPHYLL   ALKALINITY
                        MATERIAL       TOTAL       DISSOLVED     DISSOLVED    PARTICULATE     PHYLL A         -A-          PHENOL
                         PHENOL       ORGANIC      INORGANIC      ORGANIC        TOTAL                     EPILITHON     PHTHALEIN
                 SUBM                    C             C             C             C                                       CACO3
                  ID      MG/L         MG/L          MG/L          MG/L          MG/L          MG/M3         MG/M2         MG/L
SAMPLES(FLAGS)            4(0)                       4(0)          4(0)          4(0)          4(0)                        4(0)
           LOW            .015                       29.0          18.0          1.82          3.26                          .0
          HIGH            .035                       60.0          33.0          8.20         61.63                         8.3
       AVERAGE            .024                       43.0          23.8          4.64         18.47                         2.1
      STD.DEV.            .008                       13.8           6.7          3.05         28.79                         4.1
  PERCNT:10TH
          25TH            .019                       32.0          19.0          2.11          3.43                          .0
   MEDIAN 50TH            .023                       41.5          22.0          4.28          4.49                          .0
          75TH            .029                       54.0          28.5          7.18         33.50                         4.2
          90TH
SECONDARY CODE        37L

                         10101L        06301L        06201L        17203L        16306L        09107L        14102L        10602L
                       ALKALINITY    CARBONATE     BICARBONT.     CHLORIDE      SULPHATE      FLUORIDE       SILICA       HARDNESS
                         TOTAL        (CALCD.)       (CALCD.)     DISSOLVED     DISSOLVED     DISSOLVED     REACTIVE        TOTAL
                                                                                                                         (CALCD.)
                 SUBM    CACO3          CO3          HCO3            CL           SO4            F            SIO2         CACO3
                  ID      MG/L         MG/L         MG/L            MG/L          MG/L          MG/L          MG/L         MG/L
SAMPLES(FLAGS)            4(0)          4(0)          4(0)          4(0)          4(0)          4(0)          4(1)          4(0)
           LOW            112.            0.          137.          15.0           85.           .18           L.5          176.
          HIGH            242.           10.          295.           62.          550.           .59          14.1          524.
       AVERAGE            177.            2.          210.          30.5          226.           .35          7.5*          305.
      STD.DEV.             54.            5.           65.          22.2          219.           .20          5.8*          154.
  PERCNT:10TH
          25TH            138.            0.          168.          15.0           93.           .19          3.1*          200.
   MEDIAN 50TH            177.            0.          205.          22.5          135.           .31           7.7          260.
          75TH            216.            5.          253.          46.0          360.           .51          11.8          410.
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  23                  NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                  SURFACE WATER DATA
STATION 00AL05EB2140    LAT. 53D 31M 43S  LONG. 113D 29M 26S   PR 3   UTM 12 334900E 5933750N  FOR MAY 17, 1983 TO AUG 03, 1983
MILLCREEK AT MOUTH

                         20110L      12102L      11103L      19103L      15406L      15419L      07403L      07602L
                         CALCIUM    MAGNESIUM    SODIUM     POTASSIUM  PHOSPHOROUS  PHOSPHORUS   NITROGEN    NITROGEN
                        DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED     TOTAL       TOTAL     TOTAL ORG.    TOTAL
                                                                        PHOSPHATE   PHOSPHATE    (CALCD.)    (CALCD.)
                 SUBM      CA          MG          NA          K            P           P           N           N
                  ID      MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            4(0)        4(0)        4(0)        4(0)                    4(0)                    4(3)
           LOW             49.        13.0        22.0         9.9                    .380                  Q1.510
          HIGH            116.        57.0       136.         13.0                   2.600                 Q25.550
       AVERAGE             75.        28.8        60.3        11.7                   1.074                   8.077*
      STD.DEV.             29.        19.7        53.5         1.3                   1.038                  11.667*
  PERCNT:10TH
          25TH             55.        15.5        22.5        10.9                    .423                   1.830
   MEDIAN 50TH             67.        22.5        41.5        12.0                    .658                   2.625
          75TH             95.        42.0        98.0        12.5                   1.725                  14.325
          90TH
SECONDARY CODE                                                                        21L

                         07021L      07503L      07562L      07205L      07206L      07105L      07906L      10407L
                        NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN     RESIDUE
                          TOTAL       TOTAL     DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED  PARTICULATE NONFILTRABLE
                        KJELDAHL     AMMONIA     AMMONIA     NITRITE     NITRITE   NO3 & NO2     TOTAL
                 SUBM      N           N           N           N           N           N           N
                  ID      MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            4(0)                    4(0)        4(4)                    4(3)        4(0)        4(0)
           LOW           1.460                    .034        L.05                    L.05         .10         23.
          HIGH          25.500                   8.930        L.05                     .20        1.11        276.
       AVERAGE           7.990                   2.366                                 .087*       .638       125.
      STD.DEV.          11.688                   4.379                                 .075*       .481       122.
  PERCNT:10TH
          25TH           1.780                    .067       L.050                   L.050        .235         27.
   MEDIAN 50TH           2.500                    .250       L.050                   L.050        .670        101.
          75TH          14.200                   4.665       L.050                    .125*      1.040        224.
          90TH
SECONDARY CODE

                         10474L      10453L      00205L      36001L      36011L      36102L      36910L      29009L
                         RESIDUE     RESIDUE      TOTAL     COLIFORMS   COLIFORMS    STREP.    STD. PLATE    COPPER
                          TOTAL     FILTRABLE   DISSOLVED     TOTAL       FECAL       FECAL       COUNT       TOTAL
                                                  SOLIDS                                       BACT.DENS.
                                                               MPN         MPN         MF                     CU
                 SUBM
                  ID      MG/L        MG/L        MG/L      NO/100ML    NO/100ML    NO/100ML     NO/ML        MG/L
SAMPLES(FLAGS)            4(0)        4(0)        4(0)        4(0)        4(0)        4(0)        4(0)        4(0)
           LOW            340.        310.        264.        800.          4.        120.        910.        .006
          HIGH           1506.       1230.       1045.      66000.      19000.      85000.      44000.        .020
       AVERAGE            758.        633.        527.      28450.      10501.      25630.      20478.        .013
      STD.DEV.            513.        417.        365.      27592.       9468.      39789.      17968.        .006
  PERCNT:10TH
          25TH            451.        350.        272.       9400.       2502.       4110.       7955.        .008
   MEDIAN 50TH            593.        495.        399.      23500.      11500.       8700.      18500.        .012
          75TH           1065.        915.        782.      47500.      18500.      47150.      33000.        .018
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  24                          NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                            SURFACE WATER DATA
STATION 00AL05EB2140    LAT. 53D 31M 43S  LONG. 113D 29M 26S   PR 3   UTM 12 334900E 5933750N  FOR MAY 17, 1983 TO AUG 03, 1983
MILLCREEK AT MOUTH

                            30009L      26304L      13306L      25003L      28009L      42009L      27009L      33005L
                             ZINC        IRON      ALUMINUM    MANGANESE    NICKEL    MOLYBDENUM    COBALT     ARSENIC
                            TOTAL      EXTRBLE.    EXTRBLE.     TOTAL       TOTAL       TOTAL       TOTAL      TOTAL

                      SUBM    ZN          FE          AL          MN          NI          MO          CO          AS
                        ID   MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)               4(0)        4(0)        4(0)        4(0)        4(0)        4(3)        4(2)        4(0)
           LOW               .024         .47        .160        .107        .006       L.001       L.001       .0021
          HIGH               .049        3.60        2.09        .261        .022        .006        .003        .004
       AVERAGE               .039        1.62        .680        .167        .014        .002*       .002*      .0029
      STD.DEV.               .010        1.39        .941        .068        .007        .003*       .001*      .0009
  PERCNT:10TH
          25TH               .032         .69        .185        .118        .009       L.001       L.001       .0022
  MEDIAN  50TH               .041        1.21        .235        .150        .015       L.001        .001*      .0027
          75TH               .045        2.55       1.175        .216        .020        .003*       .003       .0036
          90TH
SECONDARY CODE
                            04304L      48009L      24009L      82302L      82009L      80015L      34005L      23009L
                           BERYLLIUM    CADMIUM    CHROMIUM      LEAD        LEAD      MERCURY     SELENIUM    VANADIUM
                            EXTRBLE.     TOTAL       TOTAL      EXTRBLE.     TOTAL       TOTAL      TOTAL        TOTAL

                      SUBM    BE          CD          CR          PB          PB          HG          SE          V
                        ID   MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)               4(4)        4(1)        4(0)        4(2)                    4(3)        4(3)        4(0)
           LOW              L.001       L.001        .003       L.003                  L.0001      L.0002        .006
          HIGH              L.001        .003        .009        .006                   .0002       .0007        .009
       AVERAGE                           .002*       .005        .004*                  .0001*      .0003*       .007
      STD.DEV.                           .001*       .003        .001*                  .0001*      .0003*       .002
  PERCNT:10TH
          25TH              L.001        .001*       .003       L.003                  L.0001      L.0002        .006
  MEDIAN  50TH              L.001        .002        .004        .003*                 L.0001      L.0002        .007
          75TH              L.001        .003        .007        .005                   .0001*      .0004*       .009
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  25                   NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                   SURFACE WATER DATA
STATION 00AL05EB2169    LAT. 53D 32M 50S  LONG. 113D 29M 19S   PR 3   UTM 12 335100E 5935800N  FOR JUN 28, 1983 TO AUG 23, 1983
FULTON CREEK AT MOUTH

                       97251F       02065F       08102F       02042F       02041L       10301L       08202L       08301L
                      DEPTH OF   TEMPERATURE     OXYGEN      SPECIFIC     SPECIFIC        PH         OXYGEN       OXYGEN
                      SAMPLING      WATER      DISSOLVED     CONDUCT.     CONDUCT.                  BIOCHEM.    TOTAL COD
                                                                                                  DEMAND-BOD
                                                 02                                                   02           02
                SUBM  FROM SURF.                MG/L                                                 MG/L         MG/L
                 ID      M          DEG.C                    USIE/CM      US/CM       PH UNITS
SAMPLES(FLAGS)                       2(0)        2(0)         2(0)         4(0)        4(0)         4(0)         4(0)
           LOW                       17.          6.          450.         911.         7.1         37.8         74.9
          HIGH                       18.          6.          990.        1025.         7.3        128.0        208.1
       AVERAGE                       17.5         6.0         720.         966.                     87.7        169.2
      STD.DEV.                        .7           .0         382.          58.                     37.9         63.1
  PERCNT:10TH
          25TH                                                             917.         7.2         60.9        135.0
   MEDIAN 50TH                       17.5         6.0         720.         964.         7.2         92.5        196.8
          75TH                                                            1015.         7.3        114.5        203.3
          90TH
SECONDARY CODE                                                                                                  04L

                       06536L       06005L       06154L       06107L       06905L       06715L       06721L       10151L
                      PHENOLIC      CARBON       CARBON       CARBON       CARBON     CHLORO -   CHLOROPHYLL  ALKALINITY
                      MATERIAL      TOTAL      DISSOLVED    DISSOLVED   PARTICULATE    PHYLL A        -A-         PHENOL
                       PHENOL      ORGANIC     INORGANIC     ORGANIC       TOTAL                  EPILITHON    PHTHALEIN
                                      C            C            C            C                                  CACO3
                SUBM                                                                                             MG/L
                 ID     MG/L         MG/L         MG/L         MG/L         MG/L        MG/M3        MG/M2
SAMPLES(FLAGS)          4(0)                      4(0)         4(0)         4(0)        2(0)                     4(0)
           LOW          .049                      58.0         18.0        23.86        1.59                      .0
          HIGH          .150                      63.0         24.0        37.90        3.44                      .0
       AVERAGE          .088                      60.8         20.0        31.07        2.51                      .0
      STD.DEV.          .045                       2.1          2.8         6.50        1.31                      .0
  PERCNT:10TH
          25TH          .055                      59.5         18.0        25.68                                  .0
   MEDIAN 50TH          .077                      61.0         19.0        31.25        2.51                      .0
          75TH          .122                      62.0         22.0        36.45                                  .0
          90TH
SECONDARY CODE          37L

                       10101L       06301L       06201L       17203L       16306L       09107L       14102L       10602L
                     ALKALINITY   CARBONATE    BICARBONT.    CHLORIDE     SULPHATE     FLUORIDE      SILICA     HARDNESS
                        TOTAL      (CALCD.)     (CALCD.)    DISSOLVED    DISSOLVED    DISSOLVED    REACTIVE       TOTAL
                                                                                                                (CALCD.)
                                                               CL          SO4           F          SIO2         CACO3
                SUBM    CACO3        CO3          HCO3        MG/L         MG/L         MG/L         MG/L         MG/L
                 ID     MG/L         MG/L         MG/L
SAMPLES(FLAGS)          4(0)         4(0)         4(0)         4(0)         4(0)        4(0)         4(0)         4(0)
           LOW          232.          0.          283.          29.           2.         .69          9.1         233.
          HIGH          263.          0.          321.          36.         240.        1.10         11.7         330.
       AVERAGE          247.          0.          300.          33.8        144.         .90         10.5         286.
      STD.DEV.           13.          0.           16.           3.3        106.         .22          1.1          49.
  PERCNT:10TH
          25TH          238.          0.          290.          31.5         65.         .71          9.6         244.
   MEDIAN 50TH          246.          0.          299.          35.0        167.         .90         10.6         291.
          75TH          255.          0.          311.          36.0        223.        1.08         11.3         328.
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  26                   NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                  SURFACE WATER DATA
STATION 00AL05EB2169    LAT. 53D 32M 50S  LONG. 113D 29M 19S   PR 3   UTM 12 335100E 5935800N  FOR JUN 28, 1983 TO AUG 23, 1983
FULTON CREEK AT MOUTH

                          20110L       12102L       11103L       19103L       15406L       15419L       07403L       07602L
                         CALCIUM     MAGNESIUM      SODIUM     POTASSIUM   PHOSPHOROUS   PHOSPHORUS    NITROGEN     NITROGEN
                        DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED      TOTAL        TOTAL      TOTAL ORG.     TOTAL
                                                                            PHOSPHATE    PHOSPHATE    (CALCD.)     (CALCD.)
                 SUBM      CA           MG           NA           K            P            P            N            N
                  ID      MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)            4(0)         4(0)         4(0)         4(0)                      4(0)                      4(4)
           LOW             57.          22.          58.          9.0                      3.050                  Q19.550
          HIGH             83.          31.          66.         11.0                      5.250                  Q28.550
       AVERAGE             71.         26.8         61.5          9.7                      4.275
      STD.DEV.             13.          4.0          3.3           .9                       .911
  PERCNT:10TH
          25TH             59.         23.5         59.5          9.1                      3.700                   21.050
   MEDIAN 50TH             71.         27.0         61.0          9.3                      4.400                   24.550
          75TH             82.         30.0         63.5         10.1                      4.850                   27.550
          90TH
SECONDARY CODE                                                                              21L

                          07021L       07503L       07562L       07205L       07206L       07105L       07906L       10407L
                         NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN     RESIDUE
                          TOTAL        TOTAL      DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED   PARTICULATE NONFILTRABLE
                        KJELDAHL      AMMONIA      AMMONIA      NITRITE      NITRITE    NO3 & NO2      TOTAL
                 SUBM       N            N            N            N            N            N            N
                  ID      MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)            4(0)                      4(0)         4(4)                      4(4)         4(0)         4(0)
           LOW           19.500                    8.200         L.05                      L.05         3.09          64.
          HIGH           28.500                   20.000         L.05                      L.05         4.29         127.
       AVERAGE           24.250                   14.425                                                3.647          96.
      STD.DEV.            4.031                    5.474                                                 .492          26.
  PERCNT:10TH
          25TH           21.000                    9.900        L.050                     L.050         3.345          80.
   MEDIAN 50TH           24.500                   14.750        L.050                     L.050         3.605          96.
          75TH           27.500                   18.950        L.050                     L.050         3.950         112.
          90TH
SECONDARY CODE

                          10474L       10453L       00205L       36001L       36011L       36102L       36910L       29009L
                         RESIDUE      RESIDUE       TOTAL      COLIFORMS    COLIFORMS      STREP.    STD. PLATE     COPPER
                          TOTAL      FILTRABLE    DISSOLVED      TOTAL        FECAL        FECAL        COUNT        TOTAL
                                                   SOLIDS                                            BACT.DENS.
                 SUBM                                            MPN          MPN           MF                        CU
                  ID      MG/L         MG/L         MG/L      NO/100ML     NO/100ML     NO/100ML       NO/ML         MG/L
SAMPLES(FLAGS)            4(0)         4(0)         4(0)         4(1)         4(1)         4(1)         4(1)         4(0)
           LOW            664.         580.         469.       24000.       50000.       11000.        9999.         .024
          HIGH            867.         740.         591.      699999.      699999.      699999.      699999.         .073
       AVERAGE            743.         643.         537.       64000.*      75000.*      42250.*      52000.*       .036
      STD.DEV.             91.          74.          56.       41697.*      23804.*      40623.*      41045.*       .025
  PERCNT:10TH
          25TH            675.         585.         491.       28000.       55000.       14000.       18500.         .024
   MEDIAN 50TH            721.         625.         543.       66000.       75000.       29000.       49000.         .024
          75TH            812.         700.         583.       99999.       95000.       70500.       85500.         .049
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

REQUEST 0007 - 0009 PAGE 27

NAQUADAT SUMMARY REPORT APR 30, 1986
SURFACE WATER DATA

STATION 00AL05EB2169 LAT. 53D 32M 50S LONG. 113D 29M 19S PR 3 UTM 12 335100E 5935800N FOR JUN 28, 1983 TO AUG 23, 1983
FULTON CREEK AT MOUTH

	30009L ZINC TOTAL	26304L IRON EXTRBLE.	13306L ALUMINUM EXTRBLE.	25003L MANGANESE TOTAL	28009L NICKEL TOTAL	42009L MOLYBDENUM TOTAL	27009L COBALT TOTAL	33005L ARSENIC TOTAL
SUBM ID	ZN MG/L	FE MG/L	AL MG/L	MN MG/L	NI MG/L	MO MG/L	CO MG/L	AS MG/L
SAMPLES(FLAGS)	4(0)	4(0)	4(0)	4(0)	4(0)	4(2)	4(2)	4(0)
LOW	.065	.69	.540	.102	.012	L.001	L.001	.0013
HIGH	.175	2.85	1.430	.134	.048	.004	.003	.0023
AVERAGE	.102	1.36	.971	.118	.023	.002*	.002*	.0017
STD.DEV.	.052	1.01	.431	.014	.017	.002*	.001*	.0005
PERCNT:10TH								
25TH	.066	.74	.606	.107	.013	L.001	L.001	.0014
MEDIAN 50TH	.084	.95	.956	.118	.016	.002*	.002*	.0016
75TH	.138	1.98	1.335	.129	.034	.004	.003	.0021
90TH								
SECONDARY CODE								

	04304L BERYLLIUM EXTRBLE.	48009L CADMIUM TOTAL	24009L CHROMIUM TOTAL	82302L LEAD EXTRBLE.	82009L LEAD TOTAL	80015L MERCURY TOTAL	34005L SELENIUM TOTAL	23009L VANADIUM TOTAL
SUBM ID	BE MG/L	CD MG/L	CR MG/L	PB MG/L	PB MG/L	HG MG/L	SE MG/L	V MG/L
SAMPLES(FLAGS)	4(4)	4(0)	4(0)	4(0)		4(4)	4(1)	4(0)
LOW	L.001	.002	.015	.006		L.0001	L.0002	.003
HIGH	L.001	.004	.055	.016		L.0001	.003	.007
AVERAGE		.003	.028	.012			.0010*	.005
STD.DEV.		.001	.019	.004			.0014*	.002
PERCNT:10TH								
25TH	L.001	.002	.016	.009		L.0001	.0002*	.004
MEDIAN 50TH	L.001	.003	.021	.012		L.0001	.0003	.006
75TH	L.001	.004	.040	.014		L.0001	.0017	.007
90TH								
SECONDARY CODE								

* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q

```
REQUEST 0001 -  0003 PAGE  28                        NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                          SURFACE WATER DATA
STATION 00AL05EB2171    LAT. 53D 33M 52S  LONG. 113D 25M  3S   PR 3   UTM 12 339900E 5937550N  FOR MAY 19, 1982 TO FEB 29, 1984
 NORTH SASKATCHEWAN RIVER     LEFT BANK      50TH STREET FOOT BRIDGE  90M UPSTREAM

                            97251F      02065F      08102F      02042F      02041L      10301L      08202L      08301L
                           DEPTH OF   TEMPERATURE   OXYGEN     SPECIFIC    SPECIFIC       PH        OXYGEN      OXYGEN
                           SAMPLING      WATER     DISSOLVED   CONDUCT.    CONDUCT.                BIOCHEM.   TOTAL COD
                    SUBM  FROM SURF.                                                             DEMAND-BOD
                     ID       M        DEG.C          O2                                              O2          O2
SAMPLES(FLAGS)              18(0)       22(0)        MG/L       USIE/CM      US/CM     PH UNITS      MG/L        MG/L
                                                     22(0)       22(0)       24(0)       24(0)       21(6)       24(3)
           LOW                 .2          .5          6.2        290.        264.         8.0        L.3        L5.0
          HIGH                4.0        24.5         14.6        410.        361.         8.5        3.1         24.
       AVERAGE                1.7        14.2          9.7        343.        319.                    1.3*       10.8*
      STD.DEV.                 .9         6.5          2.1         35.         23.                     .7*        5.1*
  PERCNT:10TH                  .5         4.5          7.7        300.        290.         8.1         .6        L5.0
          25TH                1.5         9.0          8.5        315.        307.         8.2        L1.0         7.7
   MEDIAN 50TH                1.7        16.3          8.8        345.        319.         8.4        1.1         9.5
          75TH                2.1        19.0         11.2        365.        337.         8.4        1.4        13.5
          90TH                2.7         20.         12.8        390.        342.         8.5        2.3         18.
SECONDARY CODE                                                                                                    04L

                            06536L      06005L      06154L      06107L      06905L      06715L      06721L      10151L
                           PHENOLIC     CARBON      CARBON      CARBON      CARBON     CHLORO -  CHLOROPHYLL  ALKALINITY
                           MATERIAL     TOTAL     DISSOLVED   DISSOLVED  PARTICULATE   PHYLL A       -A-        PHENOL
                            PHENOL     ORGANIC    INORGANIC    ORGANIC      TOTAL                 EPILITHON   PHTHALEIN
                    SUBM                  C           C           C           C                                CACO3
                     ID     MG/L        MG/L        MG/L        MG/L        MG/L       MG/M3       MG/M2        MG/L
SAMPLES(FLAGS)             24(18)       11(0)       16(0)       16(0)       16(0)      10(0)        9(0)       22(15)
           LOW               .002         4.7          3.          .8         .60         .58         .0          .0
          HIGH               .005         11.        36.0         6.7        7.47        3.75      72.643        L4.2
       AVERAGE               .002*        8.1        30.1         2.4        1.79        1.62      23.250         2.9*
      STD.DEV.               .001*        2.3         7.6         1.8        1.71        1.03      23.733         2.0*
  PERCNT:10TH               L.002         5.7        29.0          .8         .62         .63                    0.
          25TH              L.002          6.        29.8         1.1         .78         .95       3.476          .0
   MEDIAN 50TH              L.002         7.5        31.5         1.7        1.32        1.09      20.571        L4.2
          75TH              L.002         10.        33.5         3.5        2.10        2.42      24.815        L4.2
          90TH               .002         11.        35.4         5.3        3.23        3.09                    L4.2
SECONDARY CODE             37L

                            10101L      06301L      06201L      17203L      16306L      09107L      14102L      10602L
                          ALKALINITY  CARBONATE   BICARBONT.   CHLORIDE    SULPHATE    FLUORIDE     SILICA     HARDNESS
                            TOTAL      (CALCD.)     (CALCD.)   DISSOLVED   DISSOLVED   DISSOLVED   REACTIVE      TOTAL
                                                                                                               (CALCD.)
                    SUBM    CACO3        CO3        HCO3          CL         SO4          F          SIO2        CACO3
                     ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L         MG/L
SAMPLES(FLAGS)              24(0)      22(15)      22(15)      23(21)       24(0)       24(0)       24(0)        24(0)
           LOW               114.          0.       Q129.         L0.         15.         .10         2.4         115.
          HIGH               147.         Q5.        179.         2.0         49.         .18         5.8         168.
       AVERAGE               131.         3.*       153.*        1.0*         35.         .13         3.9         147.
      STD.DEV.                 9.         2.*        13.*         .2*          8.         .02          .9          12.
  PERCNT:10TH                118.          0.       Q134.         L0.         25.         .11         2.7         136.
          25TH               125.          0.       Q142.         L0.         31.         .12         3.3         138.
   MEDIAN 50TH               131.          5.        155.         L0.         35.         .13         3.8         148.
          75TH               137.         Q5.        161.         L0.         40.         .14         4.4         156.
          90TH               147.         Q5.       Q169.        L1.0         43.         .14         5.0         165.
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  29                          NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                              SURFACE WATER DATA
STATION 00AL05EB2171    LAT. 53D 33M 52S  LONG. 113D 25M  3S   PR 3   UTM 12 339900E 5937550N  FOR MAY 19, 1982 TO FEB 29, 1984
 NORTH SASKATCHEWAN RIVER     LEFT BANK      50TH STREET FOOT BRIDGE  90M UPSTREAM

                           20110L      12102L       11103L      19103L       15406L      15419L      07403L      07602L
                           CALCIUM     MAGNESIUM    SODIUM      POTASSIUM   PHOSPHOROUS  PHOSPHORUS  NITROGEN    NITROGEN
                          DISSOLVED    DISSOLVED   DISSOLVED    DISSOLVED     TOTAL       TOTAL     TOTAL ORG.    TOTAL
                                                                             PHOSPHATE   PHOSPHATE   (CALCD.)    (CALCD.)
                   SUBM       CA          MG           NA          K             P           P           N           N
                    ID       MG/L        MG/L         MG/L        MG/L          MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)              24(0)       24(0)        24(0)       24(0)         10(0)       12(0)       12(12)      24(23)
           LOW                33.          8.           2.          .5          .011        .006       Q.100       Q.130
          HIGH                48.         14.           8.         1.2          .125        .148       Q.200       Q.650
       AVERAGE                41.         11.0         4.5          .8          .044        .033                    .418*
      STD.DEV.                 3.          1.4         1.4          .2          .040        .040                    .166*
  PERCNT:10TH                 37.         10.           3.          .6          .013        .008       Q.100        .180
          25TH                39.         10.0         3.5          .7          .017        .010        .100        .260
  MEDIAN  50TH                41.         11.0         5.0          .8          .025        .019        .100        .550
          75TH                43.         12.0         5.0          .9          .072        .039        .100        .550
          90TH                44.         13.           6.         1.1          .113        .062       Q.100       Q.550
SECONDARY CODE                                                                           21L

                           07021L      07503L       07562L      07205L       07206L      07105L      07906L      10407L
                          NITROGEN    NITROGEN     NITROGEN    NITROGEN     NITROGEN    NITROGEN    NITROGEN     RESIDUE
                            TOTAL       TOTAL      DISSOLVED   DISSOLVED    DISSOLVED   DISSOLVED  PARTICULATE NONFILTRABLE
                          KJELDAHL     AMMONIA      AMMONIA     NITRITE      NITRITE    NO3 & NO2    TOTAL
                   SUBM        N           N            N           N            N           N           N
                    ID       MG/L        MG/L         MG/L        MG/L         MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)              24(10)      12(12)       12(0)       23(23)       12(12)      24(23)      16(6)       17(0)
           LOW               .080        L.4         .003        L.05         L.007       L.05        L.01          3.
          HIGH               .6          L.4         .070        L.050        L.007       .060        .46         137.
       AVERAGE               .368*                   .018                                 .050*       .102*        25.
      STD.DEV.               .167*                   .019                                 .002*       .136*        32.
  PERCNT:10TH                .120        L.4         .004        L.05         L.007       L.05        L.01          5.
          25TH               .210        L.40        .006        L.05         L.007       L.050       L.010        10.
  MEDIAN  50TH              L.500        L.40        .010        L.05         L.007       L.050       .050         16.
          75TH              L.500        L.40        .021        L.05         L.007       L.050       .110         21.
          90TH               .5          L.4         .036        L.05         L.007       L.05        .35          49.
SECONDARY CODE             01L

                           10474L      10453L       00205L      36001L       36011L      36102L      36910L      29009L
                           RESIDUE     RESIDUE      TOTAL      COLIFORMS    COLIFORMS    STREP.    STD. PLATE    COPPER
                            TOTAL     FILTRABLE   DISSOLVED      TOTAL        FECAL       FECAL       COUNT       TOTAL
                                                   SOLIDS                                          BACT.DENS.
                                                                 MPN          MPN          MF                     CU
                   SUBM
                    ID       MG/L        MG/L         MG/L      NO/100ML     NO/100ML    NO/100ML     NO/ML       MG/L
SAMPLES(FLAGS)              17(0)       17(0)        24(0)       22(0)        22(0)       22(0)       21(0)      24(13)
           LOW               201.        180.         132.        470.          56.         10.         25.       L.001
          HIGH               367.        300.         205.      38000.        9500.       1500.      21000.        .011
       AVERAGE               271.        246.         172.       4153.         856.        247.       1873.        .003*
      STD.DEV.                36.         29.          15.       8257.        1974.        402.       4489.        .003*
  PERCNT:10TH                241.        220.         157.        510.         120.         50.        200.       L.001
          25TH               253.        230.         163.        650.         160.         60.        300.       L.001
  MEDIAN  50TH               270.        240.         171.       1200.         340.        100.        640.       L.001
          75TH               279.        260.         184.       3000.         630.        290.       1100.        .004
          90TH               321.        290.         188.      11000.         890.        340.       2600.        .007
SECONDARY CODE                                                 02L          12L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  30                         NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                         SURFACE WATER DATA
STATION 00AL05EB2171    LAT. 53D 33M 52S  LONG. 113D 25M  3S   PR 3   UTM 12 339900E 5937550N  FOR MAY 19, 1982 TO FEB 29, 1984
 NORTH SASKATCHEWAN RIVER     LEFT BANK      50TH STREET FOOT BRIDGE  90M UPSTREAM

                          30009L      26304L      13306L      25003L      28009L      42009L      27009L      33005L
                           ZINC        IRON      ALUMINUM    MANGANESE    NICKEL    MOLYBDENUM    COBALT      ARSENIC
                          TOTAL      EXTRBLE.    EXTRBLE.     TOTAL       TOTAL       TOTAL       TOTAL       TOTAL
                  SUBM
                   ID      ZN          FE          AL          MN          NI          MO          CO          AS
                          MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            24(0)       24(0)       20(0)       21(7)       24(5)       20(18)      24(22)      16(4)
           LOW             .002         .03        .035        L.008       L.001       L.001       L.001      L.0002
          HIGH             .058        1.58       4.000         .098        .014        .005        .005       .0020
       AVERAGE             .019         .38        .587         .022*       .005*       .001*       .001*      .0007*
      STD.DEV.             .016         .38        .961         .023*       .003*       .001*       .001*      .0006*
  PERCNT:10TH              .003         .09        .084        L.008       L.001       L.001       L.001      L.0002
          25TH             .006         .12        .158        L.008        .004       L.001       L.001       .0003
  MEDIAN  50TH             .017         .22        .220         .014        .004       L.001       L.001       .0004
          75TH             .032         .54        .459         .019        .006       L.001       L.001       .0009
          90TH             .038         .87       1.860         .042        .011        .002*      L.001       .0018
SECONDARY CODE

                          04304L      48009L      24009L      82302L      82009L      80015L      34005L      23009L
                         BERYLLIUM    CADMIUM    CHROMIUM      LEAD        LEAD       MERCURY    SELENIUM    VANADIUM
                          EXTRBLE.     TOTAL       TOTAL      EXTRBLE.     TOTAL       TOTAL       TOTAL       TOTAL
                  SUBM
                   ID      BE          CD          CR          PB          PB          HG          SE          V
                          MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            20(20)      24(20)      24(8)       9(8)        12(8)       12(12)      16(13)      20(11)
           LOW            L.001       L.001       L.001       L.003       L.003       L.0001      L.0002      L.002
          HIGH            L.001        .002        .018        .008        .050       L.0001       .0007       .013
       AVERAGE                         .001*       .005*       .004*       .007*                   .0003*      .004*
      STD.DEV.                         .000*       .005*       .002*       .013*                   .0001*      .003*
  PERCNT:10TH             L.001       L.001       L.001                   L.003       L.0001      L.0002      L.002
          25TH            L.001       L.001       L.001       L.003       L.003       L.0001      L.0002      L.002
  MEDIAN  50TH            L.001       L.001        .003       L.003       L.003       L.0001      L.0002      L.002
          75TH            L.001       L.001        .006       L.003        .004       L.0001      L.0002       .005
          90TH            L.001        .002        .011                    .004       L.0001       .0004       .007
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  31                    NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                      SURFACE WATER DATA
STATION 00AL05EB2172    LAT. 53D 33M 50S  LONG. 113D 25M  3S   PR 3   UTM 12 339900E 5937500N  FOR MAY 19, 1982 TO NOV 15, 1983
 NORTH SASKATCHEWAN RIVER   -   CENTRE     50TH STREET FOOT BRIDGE  90M UPSTREAM

                         97251F      02065F      08102F      02042F      02041L      10301L      08202L      08301L
                        DEPTH OF   TEMPERATURE   OXYGEN     SPECIFIC    SPECIFIC       PH        OXYGEN      OXYGEN
                        SAMPLING     WATER      DISSOLVED   CONDUCT.    CONDUCT.                BIOCHEM.   TOTAL COD
                                                                                               DEMAND-BOD
                  SUBM  FROM SURF.                 O2                                              O2          O2
                   ID      M         DEG.C        MG/L       USIE/CM      US/CM     PH UNITS      MG/L        MG/L
SAMPLES(FLAGS)           16(0)       21(0)       22(0)       21(0)       22(0)       22(0)       19(7)       22(3)
           LOW             1.2          .5         6.2        280.        262.         8.0         L.3        L5.0
          HIGH             3.4        24.0        14.5        410.        361.         8.5         3.2         26.
       AVERAGE             2.2        14.4         9.7        345.        318.                     1.2*       11.5*
      STD.DEV.              .6         6.0         2.1         36.         24.                      .7*        5.8*
   PERCNT:10TH             1.4         7.0         7.4        300.        289.         8.2         L.3        L5.0
          25TH             1.8         10.         8.4        325.        304.         8.3          .9         6.1
   MEDIAN 50TH             2.1        16.5         8.9        350.        319.         8.4        L1.0        10.1
          75TH             2.5        18.0        10.9        365.        334.         8.4         1.7         15.
          90TH             3.1        19.8        12.6        385.        343.         8.4         2.2        19.0
SECONDARY CODE                                                                                               04L

                         06536L      06005L      06154L      06107L      06905L      06715L      06721L      10151L
                        PHENOLIC     CARBON      CARBON      CARBON      CARBON     CHLORO -   CHLOROPHYLL ALKALINITY
                        MATERIAL     TOTAL     DISSOLVED   DISSOLVED  PARTICULATE   PHYLL A       -A-        PHENOL
                         PHENOL     ORGANIC    INORGANIC    ORGANIC      TOTAL                 EPILITHON   PHTHALEIN
                  SUBM                 C           C           C           C                                CACO3
                   ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/M3       MG/M2       MG/L
SAMPLES(FLAGS)           22(14)      10(0)       14(0)       14(0)       14(0)       10(0)                   22(14)
           LOW           L.002         3.9          2.          .8         .18         .49                     .0
          HIGH            .005        10.2        36.0         6.5        6.62        3.41                    L4.2
       AVERAGE            .002*        7.2        29.7         2.6        1.44        1.72                     2.7*
      STD.DEV.            .001*        2.0         8.3         1.7        1.60        1.04                     2.1*
   PERCNT:10TH           L.002         4.2        29.0          .9         .49         .56                    0.
          25TH           L.002          6.        29.6         1.2         .66         .95                     .0
   MEDIAN 50TH           L.002         7.5        31.5         2.1         .92        1.28                    L4.2
          75TH            .003          8.        33.0         3.8        1.94        2.68                    L4.2
          90TH            .004        10.1        34.9         4.9        2.01        3.13                    L4.2
SECONDARY CODE           37L

                         10101L      06301L      06201L      17203L      16306L      09107L      14102L      10602L
                       ALKALINITY  CARBONATE   BICARBONT.   CHLORIDE    SULPHATE    FLUORIDE     SILICA     HARDNESS
                         TOTAL      (CALCD.)     (CALCD.)   DISSOLVED   DISSOLVED   DISSOLVED   REACTIVE      TOTAL
                                                                                                            (CALCD.)
                  SUBM   CACO3        CO3        HCO3          CL         SO4          F          SIO2        CACO3
                   ID     MG/L        MG/L       MG/L         MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           22(0)       22(14)      22(14)      22(21)      22(0)       22(0)       22(0)       22(0)
           LOW            114.          0.       Q129.         L0.         25.         .10         2.4        115.
          HIGH            149.         Q5.        182.          2.         50.         .17         6.0        173.
       AVERAGE            131.          3.*       153.*        1.0*        35.         .13         3.9        145.
      STD.DEV.             10.          2.*        14.*         .2*         7.         .02          .9         13.
   PERCNT:10TH            119.          0.       Q135.         L0.         25.         .11         2.7        134.
          25TH            124.          0.       Q142.         L0.         30.         .12         3.2        136.
   MEDIAN 50TH            130.          5.        155.        L1.0         35.         .13         3.8        144.
          75TH            136.         Q5.        158.         L0.         40.         .14         4.5        155.
          90TH            146.         Q5.       Q169.         L0.         45.         .15         5.0        159.
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  32                     NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                       SURFACE WATER DATA
STATION 00AL05EB2172    LAT. 53D 33M 50S  LONG. 113D 25M  3S   PR 3   UTM 12 339900E 5937500N  FOR MAY 19, 1982 TO NOV 15, 1983
 NORTH SASKATCHEWAN RIVER   -   CENTRE     50TH STREET FOOT BRIDGE  90M UPSTREAM

                          20110L        12102L        11103L        19103L        15406L        15419L        07403L        07602L
                         CALCIUM     MAGNESIUM        SODIUM     POTASSIUM   PHOSPHOROUS    PHOSPHORUS      NITROGEN      NITROGEN
                       DISSOLVED     DISSOLVED     DISSOLVED     DISSOLVED         TOTAL         TOTAL    TOTAL ORG.         TOTAL
                                                                               PHOSPHATE     PHOSPHATE      (CALCD.)      (CALCD.)
              SUBM            CA            MG            NA             K             P             P             N             N
                ID          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
    SAMPLES(FLAGS)         22(0)         22(0)         22(0)         22(0)         10(0)         10(0)        12(12)        22(22)
               LOW           33.            8.            2.            .5           .01          .008         Q.100         Q.170
              HIGH           49.           14.            8.           1.4           .13          .154         Q.100         Q.550
           AVERAGE           40.          10.8           4.8            .9          .043          .041
          STD.DEV.            4.           1.3           1.7            .2          .043          .045
       PERCNT:10TH           36.           10.            3.            .6          .012          .010         Q.100         Q.210
              25TH           38.           10.            4.            .7          .014          .012          .100         Q.290
       MEDIAN 50TH           40.          11.0           4.5            .8          .022          .024          .100          .550
              75TH           42.           11.            6.            .9          .055          .048          .100         Q.550
              90TH           45.           12.            7.           1.2          .119          .114         Q.100         Q.550
SECONDARY CODE                                                                                     21L
                          07021L        07503L        07562L        07205L        07206L        07105L        07906L        10407L
                        NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN       RESIDUE
                           TOTAL         TOTAL     DISSOLVED     DISSOLVED     DISSOLVED     DISSOLVED   PARTICULATE  NONFILTRABLE
                        KJELDAHL       AMMONIA       AMMONIA       NITRITE       NITRITE     NO3 & NO2         TOTAL
              SUBM             N             N             N             N             N             N             N
                ID          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
    SAMPLES(FLAGS)        22(10)        12(12)         10(0)        22(22)        12(12)        22(22)         14(5)         14(0)
               LOW          .120           L.4          .005          L.05         L.007          L.05          L.01            6.
              HIGH          .500           L.4          .028          L.05         L.007          L.05           .48           87.
           AVERAGE         .387*                        .013                                                     .106*          26.
          STD.DEV.         .150*                        .007                                                     .142*          24.
       PERCNT:10TH          .160           L.4          .006          L.05         L.007          L.05          L.01            6.
              25TH          .240          L.40          .007          L.05         L.007          L.05          L.01            8.
       MEDIAN 50TH         L.500          L.40          .012         L.050         L.007         L.050          .055           18.
              75TH           L.5          L.40          .017          L.05         L.007          L.05           .10           28.
              90TH            .5           L.4          .024          L.05         L.007          L.05           .34           62.
SECONDARY CODE               01L
                          10474L        10453L        00205L        36001L        36011L        36102L        36910L        29009L
                         RESIDUE       RESIDUE         TOTAL     COLIFORMS     COLIFORMS        STREP.    STD. PLATE        COPPER
                           TOTAL     FILTRABLE     DISSOLVED         TOTAL         FECAL         FECAL         COUNT         TOTAL
                                                      SOLIDS                                              BACT.DENS.
              SUBM                                                     MPN           MPN            MF                          CU
                ID          MG/L          MG/L          MG/L      NO/100ML      NO/100ML      NO/100ML         NO/ML          MG/L
    SAMPLES(FLAGS)         14(0)         14(0)         22(0)         22(0)         22(0)         22(0)         21(0)         22(9)
               LOW          208.          190.          139.          180.           30.            8.           78.         L.001
              HIGH          347.          300.          208.        14000.         1000.          840.         5700.          .006
           AVERAGE          272.          246.          171.         2334.          272.          143.          915.         .002*
          STD.DEV.           37.           31.           15.         3469.          258.          182.         1235.         .002*
       PERCNT:10TH          228.          200.          157.          300.           50.           20.          150.         L.001
              25TH          252.          230.          161.          530.           68.           50.          350.         L.001
       MEDIAN 50TH          267.          255.          170.          880.          185.          105.          520.          .002
              75TH          286.          260.          180.         1800.          410.          130.         1000.          .003
              90TH          319.          280.          189.         7000.          700.          270.         1700.          .005
SECONDARY CODE                                                         02L           12L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  33                      NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                        SURFACE WATER DATA
STATION 00AL05EB2172    LAT. 53D 33M 50S  LONG. 113D 25M  3S   PR 3   UTM 12 339900E 5937500N  FOR MAY 19, 1982 TO NOV 15, 1983
 NORTH SASKATCHEWAN RIVER    -    CENTRE      50TH STREET FOOT BRIDGE  90M UPSTREAM

                              30009L      26304L      13306L      25003L      28009L      42009L      27009L      33005L
                               ZINC        IRON      ALUMINUM   MANGANESE     NICKEL    MOLYBDENUM    COBALT     ARSENIC
                              TOTAL      EXTRBLE.    EXTRBLE.     TOTAL       TOTAL       TOTAL       TOTAL      TOTAL

                     SUBM       ZN          FE          AL          MN          NI          MO          CO          AS
                      ID       MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)                22(3)       22(0)       18(1)       19(6)       22(3)       18(16)      22(20)      14(0)
           LOW                L.001         .04       L.020       L.008       L.001       L.001       L.001       .0003
          HIGH                 .048        1.99       3.090        .106        .014        .007        .005       .0017
       AVERAGE                 .021*        .44        .612*       .026*       .005*       .001*       .001*      .0007
     STD.DEV.                  .017*        .48        .938*       .026*       .003*       .002*       .001*      .0004
   PERCNT:10TH                L.001         .10        .075       L.008       L.001       L.001       L.001       .0003
          25TH                 .003         .13        .145       L.008        .004       L.001       L.001       .0004
   MEDIAN 50TH                 .018         .24        .195        .016        .004       L.001       L.001       .0005
          75TH                 .037         .66        .508        .040        .006       L.001       L.001       .0010
          90TH                 .045        1.00       2.790        .077        .009        .004       L.001       .0012
SECONDARY CODE
                              04304L      48009L      24009L      82302L      82009L      80015L      34005L      23009L
                            BERYLLIUM    CADMIUM     CHROMIUM      LEAD        LEAD      MERCURY     SELENIUM    VANADIUM
                             EXTRBLE.     TOTAL       TOTAL      EXTRBLE.     TOTAL       TOTAL      TOTAL        TOTAL

                     SUBM       BE          CD          CR          PB          PB          HG          SE          V
                      ID       MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)                18(18)      22(18)      22(5)        7(4)       12(10)      10(10)      14(12)      18(9)
           LOW                L.001       L.001       L.001       L.003       L.003       L.0001      L.0002      L.002
          HIGH                L.001        .002        .016        .005        .054       L.0001       .0007       .011
       AVERAGE                             .001*       .005*       .004*       .007*                   .0002*      .004*
     STD.DEV.                              .000*       .004*       .001*       .015*                   .0001*      .003*
   PERCNT:10TH                L.001       L.001       L.001                   L.003       L.0001      L.0002      L.002
          25TH                L.001       L.001        .003       L.003       L.003       L.0001      L.0002      L.002
   MEDIAN 50TH                L.001       L.001        .004       L.003       L.003       L.0001      L.0002       .002*
          75TH                L.001       L.001        .005        .004       L.003       L.0001      L.0002       .004
          90TH                L.001        .002        .007                    .004       L.0001       .0004       .010
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  34                        NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                          SURFACE WATER DATA
STATION 00AL05EB2173    LAT. 53D 33M 47S  LONG. 113D 25M  3S   PR 3   UTM 12 339900E 5937400N  FOR MAY 19, 1982 TO FEB 29, 1984
 NORTH SASKATCHEWAN RIVER   RIGHT BANK     50TH STREET FOOT BRIDGE  90M UPSTREAM

                         97251F       02065F       08102F       02042F       02041L       10301L       08202L       08301L
                        DEPTH OF    TEMPERATURE    OXYGEN      SPECIFIC     SPECIFIC        PH          OXYGEN       OXYGEN
                        SAMPLING       WATER      DISSOLVED    CONDUCT.     CONDUCT.                   BIOCHEM.     TOTAL COD
                                                                                                     DEMAND-BOD
                  SUBM  FROM SURF.                  O2                                                   O2           O2
                   ID       M          DEG.C       MG/L        USIE/CM       US/CM      PH UNITS        MG/L         MG/L
SAMPLES(FLAGS)           18(0)        23(0)        23(0)        22(0)        24(0)        24(0)        22(7)        24(3)
           LOW               .2           .5          6.3         290.         266.          7.9          L.3         L5.0
          HIGH              3.0         25.0         14.5         415.         365.          8.5          2.8        141.6
       AVERAGE              1.3         13.3          9.8         349.         321.                       1.2*        18.6*
      STD.DEV.               .7          7.0          2.1          35.          24.                        .6*        27.5*
   PERCNT:10TH               .5          1.5          7.5         300.         289.          8.0           .5         L5.0
          25TH               .9          7.5          8.4         325.         310.          8.1           .9          7.3
    MEDIAN 50TH             1.0          16.          8.9         355.         322.          8.3          1.0*        10.5
          75TH              1.8         18.5         11.0         368.         338.          8.4          1.6         21.0
          90TH              2.4         19.0         12.9         390.         343.          8.4          1.8          27.
SECONDARY CODE                                                                                                        04L

                         06536L       06005L       06154L       06107L       06905L       06715L       06721L       10151L
                        PHENOLIC      CARBON       CARBON       CARBON       CARBON      CHLORO -    CHLOROPHYLL   ALKALINITY
                        MATERIAL      TOTAL       DISSOLVED    DISSOLVED   PARTICULATE   PHYLL A        -A-          PHENOL
                         PHENOL      ORGANIC      INORGANIC     ORGANIC      TOTAL                   EPILITHON    PHTHALEIN
                  SUBM                  C            C            C            C                                  CACO3
                   ID     MG/L         MG/L         MG/L         MG/L         MG/L        MG/M3        MG/M2         MG/L
SAMPLES(FLAGS)           24(16)       11(0)        16(0)        16(0)        16(0)        10(0)         9(0)        22(11)
           LOW            L.002           5.           5.           .5          .07          .49        2.960           .0
          HIGH             .005          11.         36.0          8.3         7.05         7.73       92.005         L4.2
       AVERAGE             .002*         7.9         30.7          2.6         1.50         2.30       24.990          2.1*
      STD.DEV.             .001*         1.9          7.2          2.2         1.82         2.11       34.178          2.1*
   PERCNT:10TH            L.002           6.         29.0           .6          .31          .69                       .0
          25TH            L.002          6.3         30.0           .9          .55          .95        4.587           0.
    MEDIAN 50TH           L.002          7.7         32.0          1.8          .75         1.68        8.500          2.1*
          75TH             .002          9.0         34.5          4.0         1.61         2.66       19.909         L4.2
          90TH             .004          11.         35.4          5.5         4.05         5.42                     L4.2
SECONDARY CODE          37L

                         10101L       06301L       06201L       17203L       16306L       09107L       14102L       10602L
                       ALKALINITY   CARBONATE    BICARBONT.    CHLORIDE     SULPHATE     FLUORIDE      SILICA      HARDNESS
                         TOTAL       (CALCD.)     (CALCD.)    DISSOLVED    DISSOLVED    DISSOLVED    REACTIVE       TOTAL
                                                                                                                  (CALCD.)
                  SUBM   CACO3         CO3        HCO3           CL          SO4           F           SIO2         CACO3
                   ID     MG/L         MG/L       MG/L          MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)           24(0)        22(11)       22(11)       24(18)       24(1)        24(0)        24(0)        24(0)
           LOW               4.           0.           5.          L0.          L5.          .10          2.3         115.
          HIGH             148.          Q5.         178.          3.0          50.          .18          7.9         182.
       AVERAGE             126.           3.*        148.*         1.2*         35.*         .13          4.0         147.
      STD.DEV.              28.           3.*         35.*          .5*          9.*         .02          1.3          14.
   PERCNT:10TH             116.           0.        Q134.          L0.          28.          .11          2.7         132.
          25TH             124.           0.        Q141.         L1.0          30.          .12          3.2         137.
    MEDIAN 50TH            130.           3.         155.         L1.0          35.          .13          3.8         144.
          75TH             137.          Q5.         163.          1.0*         40.          .14          4.5         159.
          90TH             146.          Q5.        Q170.           2.          45.          .15          5.6         163.
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  35                     NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                         SURFACE WATER DATA
STATION 00AL05EB2173    LAT. 53D 33M 47S  LONG. 113D 25M  3S   PR 3   UTM 12 339900E 5937400N  FOR MAY 19, 1982 TO FEB 29, 1984
 NORTH SASKATCHEWAN RIVER   RIGHT BANK     50TH STREET FOOT BRIDGE  90M UPSTREAM

                           20110L       12102L       11103L       19103L       15406L       15419L       07403L       07602L
                           CALCIUM     MAGNESIUM     SODIUM      POTASSIUM   PHOSPHOROUS   PHOSPHORUS    NITROGEN     NITROGEN
                          DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED     TOTAL        TOTAL      TOTAL ORG.     TOTAL
                                                                            PHOSPHATE    PHOSPHATE     (CALCD.)     (CALCD.)
                SUBM         CA           MG           NA           K            P            P            N            N
                 ID         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)              24(0)        24(0)        24(0)        24(0)        10(0)        12(0)        12(12)       24(22)
           LOW                33.           8.           2.           .5         .017         .010        Q.100        Q.150
          HIGH                50.          14.           9.          1.9          .13         .180        Q.200         .780
       AVERAGE                41.         10.9          4.8           .9         .049         .050                      .446*
      STD.DEV.                 4.          1.5          1.6           .4         .038         .060                      .187*
  PERCNT:10TH                 37.           9.           3.           .5         .019         .010        Q.100         .190
          25TH                38.         10.0          4.0           .7         .022         .014         .100         .240
  MEDIAN 50TH                 41.         11.0          5.0           .9         .032         .024         .100         .550
          75TH                44.         12.0          5.5          1.0         .059         .051         .100         .550
          90TH                46.         13.0           7.          1.3         .114         .172        Q.100        Q.650
SECONDARY CODE                                                                              21L
                           07021L       07503L       07562L       07205L       07206L       07105L       07906L       10407L
                          NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN     RESIDUE
                            TOTAL        TOTAL      DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED  PARTICULATE  NONFILTRABLE
                          KJELDAHL      AMMONIA      AMMONIA      NITRITE      NITRITE     NO3 & NO2     TOTAL
                SUBM          N            N            N            N            N            N            N
                 ID         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)              24(11)       12(12)       12(1)        24(23)       12(12)       24(22)       16(4)        17(0)
           LOW               .100          L.4       L.002         L.05        L.007         L.05         L.01           4.
          HIGH               .660          L.4        .110          .05        L.007          .12         3.60         202.
       AVERAGE               .393*                    .030*        .050*                     .053*        .296*          30.
      STD.DEV.               .182*                    .035*        .000*                     .014*        .887*          48.
  PERCNT:10TH                .140          L.4        .004         L.05        L.007         L.05         L.01           5.
          25TH               .190         L.40        .006        L.050        L.007        L.050        .010*           9.
  MEDIAN 50TH               L.500         L.40        .010        L.050        L.007        L.050         .050          17.
          75TH              L.500         L.40        .059        L.050        L.007        L.050         .095          24.
          90TH                 .6          L.4        .068        L.050        L.007        L.050          .34          72.
SECONDARY CODE              01L
                           10474L       10453L       00205L       36001L       36011L       36102L       36910L       29009L
                           RESIDUE      RESIDUE       TOTAL      COLIFORMS    COLIFORMS     STREP.     STD. PLATE     COPPER
                            TOTAL      FILTRABLE    DISSOLVED      TOTAL        FECAL        FECAL        COUNT        TOTAL
                                                     SOLIDS                                          BACT.DENS.
                                                                    MPN          MPN          MF                       CU
                SUBM
                 ID         MG/L         MG/L         MG/L      NO/100ML     NO/100ML     NO/100ML       NO/ML         MG/L
SAMPLES(FLAGS)              17(0)        17(0)        24(0)        22(0)        22(0)        22(0)        21(0)        24(7)
           LOW               197.         180.         120.         100.          18.           4.         230.        L.001
          HIGH               462.         330.         213.       99000.       27000.        3300.      570000.        3.000
       AVERAGE               283.         253.         173.       15080.        3462.         714.       31464.        .128*
      STD.DEV.                63.          39.          18.       21486.        5915.         896.      123597.        .612*
  PERCNT:10TH                229.         190.         159.         550.         100.          16.         300.        L.001
          25TH               245.         240.         161.        2500.         470.         180.         620.        L.001
  MEDIAN 50TH                257.         240.         171.        8100.        1500.         355.        1100.         .002
          75TH               316.         280.         185.       21000.        3500.         870.        4300.         .006
          90TH               352.         300.         188.       32000.        8000.        1900.       14000.         .008
SECONDARY CODE                                                  02L          12L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  36                      NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                      SURFACE WATER DATA
STATION 00AL05EB2173    LAT. 53D 33M 47S  LONG. 113D 25M  3S   PR 3   UTM 12 339900E 5937400N  FOR MAY 19, 1982 TO FEB 29, 1984
 NORTH SASKATCHEWAN RIVER   RIGHT BANK     50TH STREET FOOT BRIDGE  90M UPSTREAM

                          30009L      26304L      13306L       25003L      28009L      42009L      27009L      33005L
                           ZINC        IRON      ALUMINUM    MANGANESE     NICKEL    MOLYBDENUM    COBALT     ARSENIC
                          TOTAL      EXTRBLE.    EXTRBLE.      TOTAL       TOTAL       TOTAL       TOTAL      TOTAL

                 SUBM      ZN          FE          AL           MN          NI          MO          CO          AS
                  ID      MG/L        MG/L        MG/L         MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            24(1)       24(1)       20(1)        21(5)       24(3)       20(19)      24(20)      17(2)
           LOW            L.001       L.02        L.020        L.008       L.001       L.001       L.001      L.0002
          HIGH             .069       2.16        3.010         .121        .016        .004        .005       .0019
       AVERAGE             .022*       .42*        .525*        .026*       .005*       .001*       .001*      .0007*
      STD.DEV.             .019*       .53*        .849*        .031*       .003*       .001*       .001*      .0005*
   PERCNT:10TH             .004        .09         .048        L.008       L.001       L.001       L.001      L.0002
          25TH             .005        .11         .104         .009        .003       L.001       L.001       .0003
   MEDIAN 50TH             .018        .21         .196         .012        .004       L.001       L.001       .0004
          75TH             .034        .51         .384         .020        .006       L.001       L.001       .0008
          90TH             .051       1.36        2.130         .081        .009       L.001        .003       .0018
SECONDARY CODE

                          04304L      48009L      24009L       82302L      82009L      80015L      34005L      23009L
                        BERYLLIUM    CADMIUM     CHROMIUM       LEAD        LEAD      MERCURY     SELENIUM    VANADIUM
                         EXTRBLE.     TOTAL       TOTAL       EXTRBLE.      TOTAL       TOTAL      TOTAL       TOTAL

                 SUBM      BE          CD          CR           PB          PB          HG          SE          V
                  ID      MG/L        MG/L        MG/L         MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            20(19)      24(17)      24(4)        10(5)       12(8)       12(11)      17(15)      20(9)
           LOW            L.001       L.001       L.001        L.003       L.003      L.0001      L.0002       L.002
          HIGH             .001        .004        .016         .007        .078       .0001       .0004        .011
       AVERAGE             .001*       .001*       .005*        .004*       .010*      .0001*      .0002*       .004*
      STD.DEV.             .000*       .001*       .004*        .002*       .021*      .0000*      .0000*       .003*
   PERCNT:10TH            L.001       L.001       L.001        L.003       L.003      L.0001      L.0002       L.002
          25TH            L.001       L.001        .003        L.003       L.003      L.0001      L.0002       L.002
   MEDIAN 50TH            L.001       L.001        .004         .003*      L.003      L.0001      L.0002        .003
          75TH            L.001        .002        .005         .006        .005      L.0001      L.0002        .004
          90TH            L.001        .002        .013         .007        .010      L.0001       .0002        .009
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  37                 NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                 SURFACE WATER DATA
STATION 00AL05EB2179    LAT. 53D 33M 13S  LONG. 113D 23M 54S   PR 3   UTM 12 341150E 5936300N  FOR MAY 18, 1983 TO OCT 12, 1983
GOLD BAR CREEK NEAR CONFLUENCE             WITH NORTH SASKATCHEWAN RIVER

                          97251F       02065F       08102F       02042F       02041L       10301L       08202L       08301L
                         DEPTH OF    TEMPERATURE    OXYGEN      SPECIFIC     SPECIFIC       PH          OXYGEN       OXYGEN
                         SAMPLING       WATER      DISSOLVED    CONDUCT.     CONDUCT.                  BIOCHEM.     TOTAL COD
                                                                                                      DEMAND-BOD
                                                     O2                                                  O2           O2
                  SUBM   FROM SURF.                                                                     MG/L         MG/L
                   ID       M          DEG.C        MG/L        USIE/CM       US/CM      PH UNITS
SAMPLES(FLAGS)            4(0)         7(0)         7(0)         7(0)         7(0)         7(0)         7(0)         7(0)
           LOW              .1          9.5          6.0         700.         674.          7.6          1.8         28.1
          HIGH              .5         23.0         14.2        1200.        1298.          8.4         57.6        175.6
       AVERAGE              .3         15.3          8.8        1061.        1083.                      11.3         69.1
      STD.DEV.              .2          5.0          2.8         173.         216.                      20.5         56.4
  PERCNT:10TH
          25TH              .2         10.0          6.1        1000.         980.          7.7          2.1         32.1
   MEDIAN 50TH              .3         15.5          8.6        1100.        1139.          8.1          3.6         34.9
          75TH              .4          20.         10.0        1200.        1277.          8.3          6.0        115.5
          90TH
SECONDARY CODE                                                                                                       04L

                          06536L       06005L       06154L       06107L       06905L       06715L       06721L       10151L
                         PHENOLIC      CARBON       CARBON       CARBON       CARBON      CHLORO -   CHLOROPHYLL   ALKALINITY
                         MATERIAL      TOTAL       DISSOLVED    DISSOLVED   PARTICULATE   PHYLL A        -A-         PHENOL
                          PHENOL      ORGANIC      INORGANIC     ORGANIC      TOTAL                   EPILITHON    PHTHALEIN
                  SUBM                   C            C            C            C                                  CACO3
                   ID     MG/L         MG/L         MG/L         MG/L         MG/L         MG/M3        MG/M2        MG/L
SAMPLES(FLAGS)            7(1)                      7(0)         7(0)         7(0)         7(0)                      7(1)
           LOW           L.002                      33.0          8.1          .55         2.32                        .0
          HIGH            .027                      75.0         43.0        11.60        36.70                      L4.2
       AVERAGE            .013*                     57.6         15.3         5.03        12.08                        .6*
      STD.DEV.            .007*                     13.6         12.4         4.37        13.23                       1.6*
  PERCNT:10TH
          25TH            .011                      51.0          8.1         1.03         2.49                        .0
   MEDIAN 50TH            .012                      59.0         11.0         5.15         5.98                        .0
          75TH            .015                      66.0         15.0         9.85        23.62                        .0
          90TH
SECONDARY CODE           37L

                          10101L       06301L       06201L       17203L       16306L       09107L       14102L       10602L
                        ALKALINITY    CARBONATE    BICARBONT.    CHLORIDE     SULPHATE     FLUORIDE      SILICA      HARDNESS
                          TOTAL        (CALCD.)     (CALCD.)    DISSOLVED    DISSOLVED    DISSOLVED     REACTIVE       TOTAL
                                                                                                                    (CALCD.)
                  SUBM    CACO3          CO3         HCO3           CL          SO4           F           SIO2         CACO3
                   ID     MG/L          MG/L         MG/L          MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)            7(0)          7(1)         7(1)          7(0)         7(0)         7(0)         7(0)         7(0)
           LOW            134.            0.         163.           32.         145.          .28          5.5         244.
          HIGH            296.           Q5.         361.           55.         355.          .74          9.2         498.
       AVERAGE            247.            1.*        299.*         46.9         269.          .50          7.9         417.
      STD.DEV.             54.            2.*         65.*          8.1          70.          .14          1.5          85.
  PERCNT:10TH
          25TH            244.            0.         297.           42.         215.          .39          6.1         385.
   MEDIAN 50TH            253.            0.        Q308.           47.         284.          .51          8.7         434.
          75TH            289.            0.         352.           54.         310.          .56          8.9         478.
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  38                       NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                        SURFACE WATER DATA
STATION 00AL05EB2179    LAT. 53D 33M 13S  LONG. 113D 23M 54S   PR 3   UTM 12 341150E 5936300N  FOR MAY 18, 1983 TO OCT 12, 1983
GOLD BAR CREEK NEAR CONFLUENCE            WITH NORTH SASKATCHEWAN RIVER

                       20110L       12102L       11103L       19103L       15406L       15419L       07403L       07602L
                      CALCIUM     MAGNESIUM      SODIUM     POTASSIUM   PHOSPHOROUS   PHOSPHORUS    NITROGEN     NITROGEN
                     DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED      TOTAL        TOTAL     TOTAL ORG.      TOTAL
                                                                         PHOSPHATE    PHOSPHATE     (CALCD.)     (CALCD.)
                SUBM     CA           MG           NA           K            P            P            N            N
                 ID     MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)          7(0)         7(0)         7(0)         7(0)                      7(0)                      7(1)
           LOW           68.          18.          37.          7.6                      .048                     1.060
          HIGH          130.          42.          96.         11.5                      .500                     2.900
       AVERAGE          109.         35.3         74.0          9.2                      .217                     1.987*
      STD.DEV.           21.          8.3         20.5          1.4                      .193                      .742*
  PERCNT:10TH
          25TH           98.          34.          58.          8.2                      .062                     1.400
   MEDIAN 50TH          115.          38.          83.          8.4                      .090                    Q1.780
          75TH          122.          42.          89.         10.5                      .400                     2.820
          90TH
SECONDARY CODE                                                                         21L

                       07021L       07503L       07562L       07205L       07206L       07105L       07906L       10407L
                      NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN      RESIDUE
                       TOTAL        TOTAL      DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED   PARTICULATE  NONFILTRABLE
                      KJELDAHL     AMMONIA      AMMONIA      NITRITE      NITRITE    NO3 & NO2      TOTAL
                SUBM     N            N            N            N            N            N            N
                 ID     MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)          7(0)                      7(0)         7(1)                      7(1)         7(0)         6(0)
           LOW          .660                      .026         L.05                      L.05          .03          14.
          HIGH         2.500                     1.900          .18                       .72         3.40         368.
       AVERAGE         1.639                      .522         .110*                     .349*        .809         141.
      STD.DEV.          .710                      .648         .048*                     .212*       1.192         164.
  PERCNT:10TH
          25TH         1.000                      .130          .07                       .17          .08          16.
   MEDIAN 50TH         1.730                      .240          .10                       .40          .32          59.
          75TH         2.320                      .700          .17                       .40         1.00         333.
          90TH
SECONDARY CODE

                       10474L       10453L       00205L       36001L       36011L       36102L       36910L       29009L
                      RESIDUE      RESIDUE       TOTAL      COLIFORMS    COLIFORMS      STREP.     STD. PLATE     COPPER
                       TOTAL      FILTRABLE    DISSOLVED      TOTAL        FECAL        FECAL        COUNT        TOTAL
                                                SOLIDS                                           BACT.DENS.
                SUBM                                         MPN          MPN           MF                       CU
                 ID     MG/L         MG/L         MG/L      NO/100ML     NO/100ML     NO/100ML       NO/ML        MG/L
SAMPLES(FLAGS)          6(0)         6(0)         7(0)         5(0)         5(0)         5(0)         5(0)         7(0)
           LOW          488.         550.         392.         270.          22.          70.        2300.         .003
          HIGH         1083.        1030.         853.       13000.         850.         300.       60000.         .024
       AVERAGE          866.         808.         693.        3560.         256.         161.       17060.         .012
      STD.DEV.          217.         168.         153.        5343.         347.         110.       24536.         .008
  PERCNT:10TH
          25TH          766.         750.         627.         730.          50.          84.        3300.         .004
   MEDIAN 50TH          909.         790.         741.        1300.          80.          90.        4700.         .014
          75TH         1044.         940.         807.        2500.         280.         260.       15000.         .020
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  39                   NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                     SURFACE WATER DATA
STATION 00AL05EB2179    LAT. 53D 33M 13S  LONG. 113D 23M 54S   PR 3   UTM 12 341150E 5936300N  FOR MAY 18, 1983 TO OCT 12, 1983
GOLD BAR CREEK NEAR CONFLUENCE            WITH NORTH SASKATCHEWAN RIVER

                      30009L     26304L     13306L     25003L     28009L     42009L     27009L     33005L
                       ZINC       IRON     ALUMINUM   MANGANESE   NICKEL   MOLYBDENUM   COBALT    ARSENIC
                       TOTAL    EXTRBLE.   EXTRBLE.    TOTAL      TOTAL      TOTAL      TOTAL     TOTAL

               SUBM    ZN         FE         AL         MN         NI         MO         CO         AS
                ID     MG/L       MG/L       MG/L       MG/L       MG/L       MG/L       MG/L       MG/L
SAMPLES(FLAGS)         7(0)       7(0)       7(0)       7(0)       7(0)       7(0)       7(3)       7(0)
           LOW         .005        .71       .025       .268       .008       .007      L.001      .0010
          HIGH         .073       3.22      6.040       .908       .028       .015       .008      .0071
       AVERAGE         .036       1.86      1.706       .678       .018       .010       .004*     .0027
      STD.DEV.         .030       1.07      2.649       .243       .008       .003       .003*     .0021
  PERCNT:10TH
          25TH         .008        .83       .025       .437       .012       .007      L.001      .0013
   MEDIAN 50TH         .028       1.60       .265       .758       .016       .009       .004      .0019
          75TH         .067       3.02      5.070       .870       .028       .011       .006      .0037
          90TH
SECONDARY CODE

                      04304L     48009L     24009L     82302L     82009L     80015L     34005L     23009L
                     BERYLLIUM   CADMIUM   CHROMIUM     LEAD       LEAD      MERCURY   SELENIUM   VANADIUM
                      EXTRBLE.    TOTAL      TOTAL    EXTRBLE.     TOTAL      TOTAL     TOTAL      TOTAL

               SUBM    BE         CD         CR         PB         PB         HG         SE         V
                ID     MG/L       MG/L       MG/L       MG/L       MG/L       MG/L       MG/L       MG/L
SAMPLES(FLAGS)         7(7)       7(2)       7(0)       7(3)                  7(7)       7(6)       7(0)
           LOW         L.001      L.001      .004      L.003                 L.0001     L.0002      .004
          HIGH         L.001       .005      .025       .052                 L.0001      .0006      .020
       AVERAGE                     .002*     .011       .014*                            .0003*     .011
      STD.DEV.                     .002*     .007       .018*                            .0002*     .007
  PERCNT:10TH
          25TH         L.001      L.001      .007      L.003                 L.0001     L.0002      .005
   MEDIAN 50TH         L.001       .002      .010       .005                 L.0001     L.0002      .009
          75TH         L.001       .004      .012       .023                 L.0001     L.0002      .020
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

REQUEST 0001 - 0003 PAGE 40

NAQUADAT SUMMARY REPORT APR 30, 1986
SURFACE WATER DATA

STATION 00AL05EB2191 LAT. 53D 33M 12S LONG. 113D 23M 34S PR 3 UTM 12 341500E 5936250N FOR MAY 18, 1982 TO NOV 02, 1982
NORTH SASKATCHEWAN RIVER LEFT BANK RUNDLE FOOT BRIDGE - 90M UPSTREAM

SUBM ID	97251F DEPTH OF SAMPLING	02065F TEMPERATURE WATER	08102F OXYGEN DISSOLVED	02042F SPECIFIC CONDUCT.	02041L SPECIFIC CONDUCT.	10301L PH	08202L OXYGEN BIOCHEM. DEMAND-BOD	08301L OXYGEN TOTAL COD
	FROM SURF. M	DEG.C	O2 MG/L	USIE/CM	US/CM	PH UNITS	O2 MG/L	O2 MG/L
SAMPLES(FLAGS)	12(0)	12(0)	12(0)	12(0)	12(0)	12(0)	11(2)	12(0)
LOW	.9	.5	7.7	290.	264.	8.1	L.3	1.6
HIGH	3.4	21.	14.8	400.	344.	8.5	2.7	28.
AVERAGE	1.7	14.4	10.1	350.	317.		1.4*	11.4
STD.DEV.	.7	6.5	2.1	38.	24.		.9*	6.8
PERCNT:10TH	1.1	5.	8.4	290.	291.	8.2	L.3	6.6
25TH	1.2	11.1	8.6	320.	302.	8.2	.3	7.5
MEDIAN 50TH	1.5	16.0	9.2	358.	321.	8.3	1.6	10.0
75TH	1.9	19.0	11.6	380.	338.	8.4	2.1	14.0
90TH	2.4	20.	12.6	390.	341.	8.5	2.6	19.
SECONDARY CODE								

SUBM ID	06536L PHENOLIC MATERIAL PHENOL	06005L CARBON TOTAL ORGANIC C	06154L CARBON DISSOLVED INORGANIC C	06107L CARBON DISSOLVED ORGANIC C	06905L CARBON PARTICULATE TOTAL C	06715L CHLORO - PHYLL A	06721L CHLOROPHYLL -A- EPILITHON	10151L ALKALINITY PHENOL PHTHALEIN CACO3
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/M3	MG/M2	MG/L
SAMPLES(FLAGS)	12(8)	11(0)	4(0)	4(0)	4(0)			12(5)
LOW	L.002	4.2	2.	2.2	.15			.0
HIGH	.005	12.	35.4	4.	2.09			L4.2
AVERAGE	.002*	8.2	24.4	3.0	.84			1.7*
STD.DEV.	.001*	2.3	15.1	.9	.86			2.2*
PERCNT:10TH	L.002	6.						.0
25TH	L.002	6.6	16.0	2.2	.33			.0
MEDIAN 50TH	L.002	8.3	30.0	3.0	.57			.0
75TH	.002	9.9	32.7	3.8	1.36			L4.2
90TH	.002	11.						L4.2
SECONDARY CODE								

SUBM ID	10101L ALKALINITY TOTAL	06301L CARBONATE (CALCD.)	06201L BICARBONT. (CALCD.)	17203L CHLORIDE DISSOLVED	16306L SULPHATE DISSOLVED	09107L FLUORIDE DISSOLVED	14102L SILICA REACTIVE	10602L HARDNESS TOTAL (CALCD.)
	CACO3 MG/L	CO3 MG/L	HCO3 MG/L	CL MG/L	SO4 MG/L	F MG/L	SIO2 MG/L	CACO3 MG/L
SAMPLES(FLAGS)	12(0)	12(5)	12(5)	12(12)	12(1)	12(0)	12(0)	12(0)
LOW	114.	0.	Q132.	L0.	L5.	.12	3.0	113.
HIGH	148.	Q5.	179.	L0.	45.	.15	5.5	165.
AVERAGE	133.	2.*	157.*		31.*	.13	4.1	143.
STD.DEV.	11.	3.*	13.*		10.*	.01	.7	14.
PERCNT:10TH	117.	0.	139.	L0.	20.	.12	3.2	136.
25TH	128.	0.	151.	L1.0	30.	.13	3.8	136.
MEDIAN 50TH	132.	0.	158.	L1.0	35.	.13	4.1	141.
75TH	141.	5.	165.	L1.0	35.	.14	4.5	153.
90TH	147.	Q5.	Q170.	L0.	40.	.14	5.0	158.
SECONDARY CODE								

* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q

REQUEST 0004 - 0006 PAGE 41

NAQUADAT SUMMARY REPORT APR 30, 1986
SURFACE WATER DATA

STATION 00AL05EB2191 LAT. 53D 33M 12S LONG. 113D 23M 34S PR 3 UTM 12 341500E 5936250N FOR MAY 18, 1982 TO NOV 02, 1982
NORTH SASKATCHEWAN RIVER LEFT BANK RUNDLE FOOT BRIDGE - 90M UPSTREAM

SUBM ID	20110L CALCIUM DISSOLVED CA MG/L	12102L MAGNESIUM DISSOLVED MG MG/L	11103L SODIUM DISSOLVED NA MG/L	19103L POTASSIUM DISSOLVED K MG/L	15406L PHOSPHOROUS TOTAL PHOSPHATE P MG/L	15419L PHOSPHORUS TOTAL PHOSPHATE P MG/L	07403L NITROGEN TOTAL ORG. (CALCD.) N MG/L	07602L NITROGEN TOTAL (CALCD.) N MG/L
SAMPLES(FLAGS)	12(0)	12(0)	12(0)	12(0)	10(0)		12(12)	12(12)
LOW	32.	8.	2.	.5	.011		Q.100	Q.550
HIGH	48.	12.	7.	1.0	.122		Q.100	Q.550
AVERAGE	40.	10.3	4.7	.8	.043			
STD.DEV.	4.	1.1	1.5	.1	.042			
PERCNT:10TH	38.	9.	3.	.7	.012		Q.100	Q.550
25TH	38.	10.0	4.0	.8	.015		.100	.550
MEDIAN 50TH	40.	10.0	4.5	.9	.018		.100	.550
75TH	43.	11.0	5.5	.9	.076		.100	.550
90TH	45.	11.	7.	.9	.114		Q.100	Q.550
SECONDARY CODE								

SUBM ID	07021L NITROGEN TOTAL KJELDAHL N MG/L	07503L NITROGEN TOTAL AMMONIA N MG/L	07562L NITROGEN DISSOLVED AMMONIA N MG/L	07205L NITROGEN DISSOLVED NITRITE N MG/L	07206L NITROGEN DISSOLVED NITRITE N MG/L	07105L NITROGEN DISSOLVED NO3 & NO2 N MG/L	07906L NITROGEN PARTICULATE TOTAL N MG/L	10407L RESIDUE NONFILTRABLE MG/L
SAMPLES(FLAGS)	12(12)	12(12)		12(12)	12(12)	12(12)	4(1)	5(0)
LOW	L.5	L.4		L.05	L.007	L.05	L.01	11.
HIGH	L.5	L.4		L.05	L.007	L.05	.19	20.
AVERAGE							.065*	15.
STD.DEV.							.084*	4.
PERCNT:10TH	L.5	L.4		L.05	L.007	L.05		
25TH	L.500	L.40		L.050	L.007	L.050	.015*	12.
MEDIAN 50TH	L.500	L.40		L.050	L.007	L.050	.030	15.
75TH	L.500	L.40		L.050	L.007	L.050	.115	15.
90TH	L.5	L.4		L.05	L.007	L.05		
SECONDARY CODE	01L							

SUBM ID	10474L RESIDUE TOTAL MG/L	10453L RESIDUE FILTRABLE MG/L	00205L TOTAL DISSOLVED SOLIDS MG/L	36001L COLIFORMS TOTAL MPN NO/100ML	36011L COLIFORMS FECAL MPN NO/100ML	36102L STREP. FECAL MF NO/100ML	36910L STD. PLATE COUNT BACT.DENS. NO/ML	29009L COPPER TOTAL CU MG/L
SAMPLES(FLAGS)	5(0)	5(0)	12(0)	12(0)	12(0)	12(0)	11(0)	12(3)
LOW	235.	220.	119.	410.	50.	20.	120.	L.001
HIGH	320.	300.	193.	13000.	1000.	390.	2800.	.007
AVERAGE	279.	264.	168.	2147.	299.	156.	637.	.003*
STD.DEV.	38.	38.	20.	3490.	276.	124.	796.	.002*
PERCNT:10TH			152.	540.	50.	30.	140.	L.001
25TH	245.	230.	159.	645.	135.	60.	150.	.001*
MEDIAN 50TH	282.	270.	170.	960.	215.	125.	340.	.002
75TH	311.	300.	184.	1900.	355.	260.	1000.	.004
90TH			188.	2800.	650.	320.	1100.	.006
SECONDARY CODE				02L	12L			

* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q

```
REQUEST 0007 -  0009 PAGE  42                     NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                     SURFACE WATER DATA
STATION 00AL05EB2191    LAT. 53D 33M 12S  LONG. 113D 23M 34S   PR 3   UTM 12 341500E 5936250N  FOR MAY 18, 1982 TO NOV 02, 1982
 NORTH SASKATCHEWAN RIVER     LEFT BANK     RUNDLE FOOT BRIDGE   -    90M UPSTREAM

                          30009L       26304L       13306L       25003L       28009L       42009L       27009L       33005L
                          ZINC         IRON         ALUMINUM     MANGANESE    NICKEL       MOLYBDENUM   COBALT       ARSENIC
                          TOTAL        EXTRBLE.     EXTRBLE.     TOTAL        TOTAL        TOTAL        TOTAL        TOTAL

                    SUBM  ZN           FE           AL           MN           NI           MO           CO           AS
                    ID    MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
    SAMPLES(FLAGS)             12(0)        12(0)         8(0)         9(2)        12(0)         8(8)       12(11)         7(1)
               LOW              .003          .04         .115        L.008         .003        L.001        L.001       L.0002
              HIGH              .050         1.35        3.310         .450         .016        L.001         .006        .0010
           AVERAGE              .032          .38         .846         .075*        .007                      .001*       .0005*
          STD.DEV.              .013          .36        1.048         .145*        .004                      .001*       .0003*
       PERCNT:10TH              .018          .14                                   .003                     L.001
              25TH              .027          .17         .313         .010         .005        L.001        L.001        .0004
       MEDIAN 50TH              .034          .25         .438         .012         .005        L.001        L.001        .0004
              75TH              .039          .46         .919         .047         .008        L.001        L.001        .0006
              90TH              .050          .76                                   .011                     L.001
    SECONDARY CODE
                          04304L       48009L       24009L       82302L       82009L       80015L       34005L       23009L
                          BERYLLIUM    CADMIUM      CHROMIUM     LEAD         LEAD         MERCURY      SELENIUM     VANADIUM
                          EXTRBLE.     TOTAL        TOTAL        EXTRBLE.     TOTAL        TOTAL        TOTAL        TOTAL

                    SUBM  BE           CD           CR           PB           PB           HG           SE           V
                    ID    MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
    SAMPLES(FLAGS)              8(8)        12(9)        12(0)                     12(7)                      7(5)         8(4)
               LOW             L.001        L.001         .003                     L.003                    L.0002        L.002
              HIGH             L.001         .006         .015                      .112                     .0007         .011
           AVERAGE                           .002*        .006                      .013*                    .0003*        .003*
          STD.DEV.                           .001*        .004                      .031*                    .0002*        .003*
       PERCNT:10TH                          L.001         .003                     L.003
              25TH             L.001        L.001         .004                     L.003                    L.0002        L.002
       MEDIAN 50TH             L.001        L.001         .005                     L.003                    L.0002         .002*
              75TH             L.001         .001*        .009                      .007                     .0004         .003
              90TH                           .003         .011                      .008
    SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

NAQUADAT SUMMARY REPORT APR 30, 1986
SURFACE WATER DATA
STATION 00AL05EB2192 LAT. 53D 33M 11S LONG. 113D 23M 40S PR 3 UTM 12 341400E 5936250N FOR MAY 18, 1982 TO NOV 02, 1982
NORTH SASKATCHEWAN RIVER - CENTRE RUNDLE FOOT BRIDGE - 90M UPSTREAM

	SUBM ID	97251F DEPTH OF SAMPLING FROM SURF. M	02065F TEMPERATURE WATER DEG.C	08102F OXYGEN DISSOLVED 02 MG/L	02042F SPECIFIC CONDUCT. USIE/CM	02041L SPECIFIC CONDUCT. US/CM	10301L PH PH UNITS	08202L OXYGEN BIOCHEM. DEMAND-BOD 02 MG/L	08301L OXYGEN TOTAL COD 02 MG/L
SAMPLES(FLAGS)		12(0)	12(0)	12(0)	12(0)	12(0)	12(0)	12(2)	12(0)
LOW		1.1	.5	7.6	295.	262.	8.2	L.3	5.6
HIGH		2.7	20.5	14.4	400.	344.	8.5	2.8	27.
AVERAGE		1.8	14.2	9.9	353.	316.		1.2*	12.7
STD.DEV.		.5	6.3	2.1	36.	25.		.9*	6.3
PERCNT:10TH		1.2	5.	8.2	300.	289.	8.2	L.3	6.7
25TH		1.2	11.1	8.5	320.	302.	8.3	.5	7.2
MEDIAN 50TH		1.8	16.0	9.0	360.	320.	8.4	1.0	11.5
75TH		2.1	18.8	11.6	380.	338.	8.4	1.5	17.5
90TH		2.4	19.	12.2	390.	341.	8.5	2.8	18.
SECONDARY CODE									

	SUBM ID	06536L PHENOLIC MATERIAL PHENOL MG/L	06005L CARBON TOTAL ORGANIC C MG/L	06154L CARBON DISSOLVED INORGANIC C MG/L	06107L CARBON DISSOLVED ORGANIC C MG/L	06905L CARBON PARTICULATE TOTAL C MG/L	06715L CHLORO - PHYLL A MG/M3	06721L CHLOROPHYLL -A- EPILITHON MG/M2	10151L ALKALINITY PHENOL PHTHALEIN CACO3 MG/L
SAMPLES(FLAGS)		12(10)	11(0)						12(9)
LOW		L.002	5.						.0
HIGH		.005	12.						L4.2
AVERAGE		.002*	8.2						3.1*
STD.DEV.		.001*	2.3						1.9*
PERCNT:10TH		L.002	5.7						0.
25TH		L.002	5.8						2.1*
MEDIAN 50TH		L.002	9.						L4.2
75TH		L.002	9.8						L4.2
90TH		.003	11.						L4.2
SECONDARY CODE									

	SUBM ID	10101L ALKALINITY TOTAL CACO3 MG/L	06301L CARBONATE (CALCD.) CO3 MG/L	06201L BICARBONT. (CALCD.) HCO3 MG/L	17203L CHLORIDE DISSOLVED CL MG/L	16306L SULPHATE DISSOLVED SO4 MG/L	09107L FLUORIDE DISSOLVED F MG/L	14102L SILICA REACTIVE SIO2 MG/L	10602L HARDNESS TOTAL (CALCD.) CACO3 MG/L
SAMPLES(FLAGS)		12(0)	12(9)	12(9)	12(12)	12(1)	12(0)	12(0)	12(0)
LOW		113.	0.	Q128.	L0.	L5.	.12	3.0	110.
HIGH		148.	Q5.	Q170.	L0.	40.	.15	5.5	159.
AVERAGE		132.	4.*	154.*		31.*	.13	4.1	143.
STD.DEV.		11.	2.*	13.*		10.*	.01	.7	13.
PERCNT:10TH		116.	0.	Q131.	L0.	25.	.12	3.2	136.
25TH		128.	3.	148.	L1.0	29.	.12	3.7	138.
MEDIAN 50TH		132.	5.	155.	L1.0	30.	.13	4.1	141.
75TH		141.	5.	164.	L1.0	39.	.14	4.5	155.
90TH		146.	Q5.	Q168.	L0.	40.	.15	5.0	156.
SECONDARY CODE									

* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q

```
REQUEST 0004 -  0006 PAGE  44                    NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                     SURFACE WATER DATA
STATION 00AL05EB2192    LAT. 53D 33M 11S  LONG. 113D 23M 40S   PR 3   UTM 12 341400E 5936250N  FOR MAY 18, 1982 TO NOV 02, 1982
 NORTH SASKATCHEWAN RIVER    -   CENTRE     RUNDLE FOOT BRIDGE   -    90M UPSTREAM

                           20110L      12102L      11103L      19103L      15406L       15419L       07403L       07602L
                          CALCIUM     MAGNESIUM    SODIUM     POTASSIUM  PHOSPHOROUS  PHOSPHORUS    NITROGEN     NITROGEN
                          DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED    TOTAL        TOTAL      TOTAL ORG.     TOTAL
                                                                         PHOSPHATE    PHOSPHATE     (CALCD.)     (CALCD.)
                    SUBM     CA          MG          NA          K            P            P            N            N
                     ID     MG/L        MG/L        MG/L        MG/L         MG/L         MG/L         MG/L         MG/L
 SAMPLES(FLAGS)            12(0)       12(0)       12(0)       12(0)        10(0)         5(0)        12(12)       12(12)
            LOW              31.          8.          2.          .5         .007         .011        Q.100        Q.550
           HIGH              46.         12.          7.         1.0         .138         .022        Q1.000       Q1.450
        AVERAGE              41.        10.2         4.3          .8         .044         .016
       STD.DEV.               4.         1.0         1.4          .1         .046         .004
   PERCNT:10TH               38.          9.          3.          .7         .010                     Q.100        Q.550
           25TH              39.        10.0         3.5          .8         .014         .015         .100         .550
   MEDIAN  50TH              41.        10.0         4.0          .9         .018         .017         .100         .550
           75TH              44.        11.0         5.0          .9         .056         .017         .100         .550
           90TH              44.         11.          6.         1.0         .127                     Q.300        Q.750
 SECONDARY CODE                                                                           21L

                           07021L      07503L      07562L      07205L      07206L       07105L       07906L       10407L
                          NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN     NITROGEN     NITROGEN     RESIDUE
                           TOTAL       TOTAL     DISSOLVED   DISSOLVED   DISSOLVED    DISSOLVED   PARTICULATE  NONFILTRABLE
                          KJELDAHL    AMMONIA     AMMONIA     NITRITE     NITRITE     NO3 & NO2      TOTAL
                    SUBM     N           N           N           N           N            N            N
                     ID     MG/L        MG/L        MG/L        MG/L        MG/L         MG/L         MG/L         MG/L
 SAMPLES(FLAGS)            12(6)       12(12)       5(0)       12(12)      12(12)       12(12)                     5(0)
            LOW             .110         L.4        .004        L.05       L.007         L.05                      10.
           HIGH             1.4          L.4        .012        L.05       L.007         L.05                      23.
        AVERAGE             .430*                   .009                                                           14.
       STD.DEV.             .353*                   .003                                                            5.
   PERCNT:10TH              .130         L.4                    L.05       L.007         L.05
           25TH             .140        L.40        .009       L.050       L.007        L.050                      11.
   MEDIAN  50TH            L.500        L.40        .010       L.050       L.007        L.050                      12.
           75TH            L.500        L.40        .011       L.050       L.007        L.050                      14.
           90TH             L.5          L.4                    L.05       L.007         L.05
 SECONDARY CODE             01L                                                            .

                           10474L      10453L      00205L      36001L      36011L       36102L       36910L       29009L
                           RESIDUE     RESIDUE      TOTAL     COLIFORMS   COLIFORMS     STREP.     STD. PLATE     COPPER
                            TOTAL     FILTRABLE   DISSOLVED     TOTAL       FECAL        FECAL        COUNT        TOTAL
                                                   SOLIDS                                           BACT.DENS.
                    SUBM                                         MPN         MPN          MF                        CU
                     ID     MG/L        MG/L        MG/L      NO/100ML    NO/100ML     NO/100ML       NO/ML        MG/L
 SAMPLES(FLAGS)             5(0)        5(0)       12(0)       12(0)       12(0)        12(0)        11(0)        12(5)
            LOW             194.        180.        118.        500.         40.          50.         110.        L.001
           HIGH             323.        300.        192.       8200.        740.         310.        3100.         .037
        AVERAGE             256.        242.        167.       1464.        237.         124.         595.         .006*
       STD.DEV.              47.         44.         19.       2163.        210.          87.         859.         .010*
   PERCNT:10TH                                      158.        500.         50.          50.         120.        L.001
           25TH             241.        230.        159.        535.         70.          56.         140.        L.001
   MEDIAN  50TH             252.        240.        167.        715.        180.          95.         320.         .003
           75TH             270.        260.        183.       1200.        335.         175.         640.         .005
           90TH                                     186.       1900.        460.         240.         780.         .006
 SECONDARY CODE                                                 02L         12L
 * THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  45                       NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                       SURFACE WATER DATA
STATION 00AL05EB2192    LAT. 53D 33M 11S  LONG. 113D 23M 40S   PR 3   UTM 12 341400E 5936250N  FOR MAY 18, 1982 TO NOV 02, 1982
 NORTH SASKATCHEWAN RIVER   -   CENTRE     RUNDLE FOOT BRIDGE   -    90M UPSTREAM

                         30009L       26304L       13306L       25003L       28009L       42009L       27009L       33005L
                          ZINC         IRON       ALUMINUM    MANGANESE      NICKEL     MOLYBDENUM     COBALT      ARSENIC
                         TOTAL       EXTRBLE.     EXTRBLE.      TOTAL        TOTAL        TOTAL        TOTAL       TOTAL

                  SUBM    ZN           FE           AL           MN           NI           MO           CO           AS
                   ID    MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)           12(0)        12(0)         8(0)         9(2)        12(0)         8(8)        12(9)         7(2)
           LOW            .017          .04         .191        L.008         .003        L.001        L.001       L.0002
          HIGH            .073         1.31        3.740         .120         .014        L.001         .005        .0009
       AVERAGE            .039          .41        1.019         .030*        .007                      .002*       .0005*
      STD.DEV.            .015          .41        1.252         .037*        .004                      .001*       .0003*
  PERCNT:10TH             .021          .11                                   .003                     L.001
          25TH            .030          .13         .257         .009         .005        L.001        L.001       L.0002
   MEDIAN 50TH            .037          .24         .500         .010         .005        L.001        L.001        .0005
          75TH            .047          .56        1.356         .044         .009        L.001         .002*       .0009
          90TH            .054         1.07                                   .013                      .003
SECONDARY CODE

                         04304L       48009L       24009L       82302L       82009L       80015L       34005L       23009L
                       BERYLLIUM     CADMIUM     CHROMIUM       LEAD         LEAD        MERCURY     SELENIUM     VANADIUM
                        EXTRBLE.      TOTAL        TOTAL      EXTRBLE.       TOTAL        TOTAL       TOTAL        TOTAL

                  SUBM    BE           CD           CR           PB           PB           HG           SE           V
                   ID    MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)            8(8)        12(10)       12(0)                     12(8)                      7(6)         7(4)
           LOW           L.001        L.001         .003                     L.003                    L.0002        L.002
          HIGH           L.001         .002         .013                      .018                     .0006         .012
       AVERAGE                         .001*        .006                      .005*                    .0003*        .004*
      STD.DEV.                         .000*        .003                      .004*                    .0002*        .004*
  PERCNT:10TH                         L.001         .003                     L.003
          25TH           L.001        L.001         .003                     L.003                    L.0002        L.002
   MEDIAN 50TH           L.001        L.001         .005                     L.003                    L.0002        L.002
          75TH           L.001        L.001         .007                      .006                    L.0002         .004
          90TH                         .002         .009                      .008
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  46                    NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                      SURFACE WATER DATA
STATION 00AL05EB2193    LAT. 53D 33M  9S  LONG. 113D 23M 43S   PR 3   UTM 12 341300E 5936200N  FOR MAY 18, 1982 TO NOV 02, 1982
 NORTH SASKATCHEWAN RIVER    RIGHT BANK     RUNDLE FOOT BRIDGE  -     90M UPSTREAM

                         97251F      02065F       08102F      02042F      02041L      10301L       08202L       08301L
                        DEPTH OF   TEMPERATURE    OXYGEN     SPECIFIC    SPECIFIC       PH         OXYGEN       OXYGEN
                        SAMPLING      WATER     DISSOLVED    CONDUCT.    CONDUCT.                 BIOCHEM.    TOTAL COD
                                                                                               DEMAND-BOD
                                                   02                                              02           02
                  SUBM  FROM SURF.                                                                             
                   ID       M         DEG.C       MG/L       USIE/CM      US/CM     PH UNITS      MG/L         MG/L
SAMPLES(FLAGS)            12(0)       12(0)       12(0)       12(0)       12(0)      12(0)       12(0)        12(0)
           LOW               .6          .5         7.6        290.        264.        7.7          .3          4.5
          HIGH              2.4         21.        14.4        540.        425.        8.5         3.1          26.
       AVERAGE              1.1        14.4        10.0        377.        332.                    1.3         13.0
      STD.DEV.               .5         6.3         2.0         68.         40.                     .9          6.5
  PERCNT:10TH                .6          5.         8.3        310.        290.        8.1          .4          5.1
          25TH               .8        11.6         8.6        318.        310.        8.1          .8          8.5
   MEDIAN 50TH              1.1        16.0         9.3        388.        332.        8.2         1.0         12.5
          75TH              1.3        19.0        11.5        405.        346.        8.3         1.7         17.3
          90TH              1.5        19.5        12.2        420.        357.        8.4         2.7          20.
SECONDARY CODE

                         06536L      06005L      06154L      06107L      06905L      06715L       06721L       10151L
                        PHENOLIC     CARBON      CARBON      CARBON      CARBON     CHLORO -   CHLOROPHYLL  ALKALINITY
                        MATERIAL     TOTAL     DISSOLVED   DISSOLVED  PARTICULATE   PHYLL A        -A-         PHENOL
                         PHENOL     ORGANIC    INORGANIC    ORGANIC      TOTAL                  EPILITHON    PHTHALEIN
                                       C           C           C           C                                  CACO3
                  SUBM
                   ID     MG/L        MG/L        MG/L        MG/L        MG/L       MG/M3        MG/M2        MG/L
SAMPLES(FLAGS)            12(8)       11(0)       4(1)        4(0)        4(0)                                12(3)
           LOW            L.002          5.         L0.         1.7         .24                                  .0
          HIGH             .008         14.        35.4          4.        1.84                                L4.2
       AVERAGE             .003*        7.9        24.4*        3.0         .95                                1.0*
      STD.DEV.             .002*        2.5        15.8*        1.1         .67                                1.9*
  PERCNT:10TH             L.002         6.1                                                                      .0
          25TH            L.002         6.1        15.5*        2.0         .49                                  .0
   MEDIAN 50TH            L.002         7.2        30.6         3.2         .85                                  .0
          75TH             .002         9.2        33.2         4.0        1.40                                2.1*
          90TH             .003         10.                                                                    L4.2
SECONDARY CODE

                         10101L      06301L      06201L      17203L      16306L      09107L       14102L       10602L
                       ALKALINITY  CARBONATE   BICARBONT.   CHLORIDE    SULPHATE    FLUORIDE      SILICA      HARDNESS
                         TOTAL      (CALCD.)     (CALCD.)   DISSOLVED   DISSOLVED   DISSOLVED    REACTIVE      TOTAL
                                                                                                              (CALCD.)
                  SUBM   CACO3        CO3        HCO3          CL         SO4          F           SIO2         CACO3
                   ID     MG/L        MG/L      MG/L          MG/L        MG/L        MG/L         MG/L         MG/L
SAMPLES(FLAGS)            12(0)       12(3)       12(3)       12(9)       12(0)      12(0)        12(0)        12(0)
           LOW             113.          0.        138.         L0.         15.        .11          3.2         113.
          HIGH             147.         Q5.        179.          9.         52.        .32          5.6         168.
       AVERAGE             133.          1.*       160.*        1.9*        35.        .16          4.2         145.
      STD.DEV.              11.          2.*        13.*        2.3*        10.        .06           .8          15.
  PERCNT:10TH              116.          0.        141.         L0.         28.        .12          3.2         136.
          25TH             130.          0.        148.        L1.0         30.        .12          3.8         138.
   MEDIAN 50TH             133.          0.        162.        L1.0         35.        .14          4.1         143.
          75TH             141.          3.        167.         1.5*        40.        .15          4.8         156.
          90TH             147.         Q5.        178.          3.         50.        .22          5.2         162.
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGL  47                        NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                          SURFACE WATER DATA
STATION 00AL05EB2193    LAT. 53D 33M  9S  LONG. 113D 23M 43S   PR 3   UTM 12 341300E 5936200N  FOR MAY 18, 1982 TO NOV 02, 1982
 NORTH SASKATCHEWAN RIVER    RIGHT BANK     RUNDLE FOOT BRIDGE  -     90M UPSTREAM

                         20110L      12102L      11103L      19103L      15406L      15419L      07403L      07602L
                        CALCIUM    MAGNESIUM     SODIUM    POTASSIUM  PHOSPHOROUS  PHOSPHORUS   NITROGEN    NITROGEN
                       DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED     TOTAL       TOTAL     TOTAL ORG.     TOTAL
                                                                       PHOSPHATE   PHOSPHATE   (CALCD.)    (CALCD.)
                SUBM       CA          MG          NA          K           P           P           N           N
                 ID       MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           12(0)       12(0)       12(0)       12(0)       10(0)                   12(11)      12(11)
           LOW             32.          8.          2.          .5        .016                   Q.100       Q.550
          HIGH             49.         12.         15.        10.0        .444                    .300       3.150
       AVERAGE             41.        10.4         6.0         1.8        .102                    .133*       .805*
      STD.DEV.              4.         1.2         3.2         2.6        .126                    .078*       .742*
   PERCNT:10TH             38.          9.          3.          .8        .022                   Q.100       Q.550
          25TH             39.        10.0         5.0          .9        .044                    .100        .550
   MEDIAN 50TH             41.        10.5         5.5         1.0        .051                    .100        .550
          75TH             44.        11.0         6.5         1.1        .111                    .100        .680
          90TH             45.         12.          7.         2.1        .283                   Q.300       Q.750
SECONDARY CODE

                         07021L      07503L      07562L      07205L      07206L      07105L      07906L      10407L
                        NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN     RESIDUE
                          TOTAL       TOTAL    DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED  PARTICULATE NONFILTRABLE
                        KJELDAHL    AMMONIA     AMMONIA     NITRITE     NITRITE    NO3 & NO2     TOTAL
                SUBM       N           N           N           N           N           N           N
                 ID       MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           12(10)      12(11)                  12(11)      12(11)      12(9)        4(0)        5(0)
           LOW            L.5         L.4                    L.05       L.002        L.05         .02          8.
          HIGH            2.9         2.6                     .13         .02         .25         .19         24.
       AVERAGE             .717*       .58*                   .057*       .008*       .088*       .078        14.
      STD.DEV.             .690*       .64*                   .023*       .004*       .071*       .078         6.
   PERCNT:10TH            L.5         L.4                    L.05       L.007        L.05
          25TH            L.500       L.40                   L.050      L.007        L.050        .025        11.
   MEDIAN 50TH            L.500       L.40                   L.050      L.007        L.050        .050        13.
          75TH            L.500       L.40                   L.050      L.007         .115*       .130        14.
          90TH             .7         L.4                    L.05       L.007         .18
SECONDARY CODE           01L

                         10474L      10453L      00205L      36001L      36011L      36102L      36910L      29009L
                         RESIDUE     RESIDUE      TOTAL     COLIFORMS   COLIFORMS     STREP.   STD. PLATE    COPPER
                          TOTAL    FILTRABLE   DISSOLVED      TOTAL       FECAL       FECAL       COUNT       TOTAL
                                                 SOLIDS                                        BACT.DENS.
                SUBM                                          MPN         MPN          MF                     CU
                 ID       MG/L        MG/L        MG/L     NO/100ML    NO/100ML    NO/100ML      NO/ML       MG/L
SAMPLES(FLAGS)            5(0)        5(0)       12(0)       12(0)       12(0)       12(0)       11(0)       12(4)
           LOW            234.        220.        128.        670.         70.         30.        200.       L.001
          HIGH            274.        260.        213.      44000.       3300.       1200.       5400.        .006
       AVERAGE            256.        242.        176.      11181.       1106.        463.       1327.        .003*
      STD.DEV.             17.         16.         21.      13558.        978.        388.       1652.        .002*
   PERCNT:10TH                                    166.       1100.        190.        100.        300.       L.001
          25TH            243.        230.        168.       1150.        285.        215.        540.       L.001
   MEDIAN 50TH            250.        250.        175.       7350.        950.        310.        710.        .002
          75TH            271.        250.        187.      15500.       1500.        695.        910.        .005
          90TH                                    197.      30000.       2300.       1100.       3700.        .005
SECONDARY CODE                                              02L         12L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  48                     NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                     SURFACE WATER DATA
STATION 00AL05EB2193    LAT. 53D 33M  9S  LONG. 113D 23M 43S   PR 3   UTM 12 341300E 5936200N  FOR MAY 18, 1982 TO NOV 02, 1982
 NORTH SASKATCHEWAN RIVER   RIGHT BANK     RUNDLE FOOT BRIDGE  -    90M UPSTREAM

                       30009L        26304L        13306L        25003L        28009L        42009L        27009L        33005L
                         ZINC         IRON         ALUMINUM      MANGANESE     NICKEL      MOLYBDENUM      COBALT        ARSENIC
                       TOTAL         EXTRBLE.      EXTRBLE.      TOTAL         TOTAL         TOTAL         TOTAL        TOTAL

               SUBM      ZN            FE            AL            MN            NI            MO            CO            AS
                ID      MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)          12(0)         12(1)          8(0)          9(2)         12(1)          8(8)         12(10)        7(0)
           LOW             .015          L.02          .139         L.008         L.001         L.001         L.001         .0003
          HIGH             .048          1.09         3.730          .119          .018         L.001          .004         .0011
       AVERAGE             .031           .31*         .939          .031*         .006*                      .001*        .0005
      STD.DEV.             .010           .28*        1.227          .037*         .004*                      .001*        .0003
   PERCNT:10TH             .019           .12                                      .003                      L.001
          25TH             .025           .15          .320          .010          .004         L.001         L.001         .0003
   MEDIAN 50TH             .031           .23          .430          .012          .005         L.001         L.001         .0004
          75TH             .038           .38         1.073          .044          .006         L.001         L.001         .0005
          90TH             .041           .54                                      .010                        .003
SECONDARY CODE

                       04304L        48009L        24009L        82302L        82009L        80015L        34005L        23009L
                       BERYLLIUM    CADMIUM       CHROMIUM        LEAD          LEAD        MERCURY       SELENIUM      VANADIUM
                        EXTRBLE.     TOTAL         TOTAL        EXTRBLE.       TOTAL         TOTAL       TOTAL           TOTAL

               SUBM      BE             CD            CR            PB            PB           HG              SE            V
                ID      MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)           8(8)         12(10)        12(1)                       12(10)                        7(6)          7(4)
           LOW            L.001         L.001         L.001                       L.003                      L.0002         L.002
          HIGH            L.001          .014          .013                        .018                       .0006          .013
       AVERAGE                           .002*         .005*                       .004*                      .0003*         .004*
      STD.DEV.                           .004*         .003*                       .004*                      .0002*         .004*
   PERCNT:10TH                          L.001          .003                       L.003
          25TH            L.001         L.001          .004                       L.003                      L.0002         L.002
   MEDIAN 50TH            L.001         L.001          .004                       L.003                      L.0002         L.002
          75TH            L.001         L.001          .007                       L.003                      L.0002          .003
          90TH                           .002          .010                        .004
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  49                      NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                          SURFACE WATER DATA
STATION 00AL05EB2221    LAT. 53D 34M 28S  LONG. 113D 23M 18S   PR 3   UTM 12 341850E 5938600N  FOR MAY 18, 1982 TO FEB 29, 1984
 NORTH SASKATCHEWAN RIVER     LEFT BANK      BEVERLY RAILWAY TRESTLE
 180M DOWNSTREAM

                          97251F       02065F       08102F       02042F       02041L       10301L       08202L       08301L
                         DEPTH OF   TEMPERATURE     OXYGEN      SPECIFIC     SPECIFIC        PH         OXYGEN       OXYGEN
                         SAMPLING      WATER       DISSOLVED    CONDUCT.     CONDUCT.                   BIOCHEM.    TOTAL COD
                                                                                                       DEMAND-BOD
                   SUBM  FROM SURF.                   O2                                                   O2           O2
                    ID       M         DEG.C         MG/L       USIE/CM       US/CM      PH UNITS        MG/L         MG/L
SAMPLES(FLAGS)            19(0)        23(0)        23(0)        21(0)        24(0)        24(0)        21(9)        24(2)
           LOW              .3           .5          6.2         290.         264.          7.8          L.0         L5.0
          HIGH             2.7         24.5         14.8         410.         374.          8.6          2.8         29.5
       AVERAGE             1.4         13.5          9.8         348.         322.                       1.2*        13.1*
      STD.DEV.              .6          7.0          2.3          35.          24.                        .8*         6.5*
  PERCNT:10TH               .5          1.0          7.2         310.         290.          8.1          L.3          7.1
          25TH              1.          8.1          8.5         320.         311.          8.1           .9          8.8
    MEDIAN 50TH            1.2          16.          9.2         350.         322.          8.3         L1.0         11.4
          75TH             1.8          19.         11.6         375.         339.          8.4          1.6         17.5
          90TH             2.1         19.5         13.2         390.         350.          8.5          2.5         21.3
SECONDARY CODE                                                                                                        04L

                          06536L       06005L       06154L       06107L       06905L       06715L       06721L       10151L
                         PHENOLIC      CARBON       CARBON       CARBON       CARBON     CHLORO -   CHLOROPHYLL   ALKALINITY
                         MATERIAL      TOTAL       DISSOLVED    DISSOLVED  PARTICULATE   PHYLL A        -A-         PHENOL
                          PHENOL      ORGANIC     INORGANIC     ORGANIC       TOTAL                  EPILITHON    PHTHALEIN
                   SUBM                  C            C            C            C                                  CACO3
                    ID     MG/L        MG/L         MG/L         MG/L         MG/L         MG/M3        MG/M2         MG/L
SAMPLES(FLAGS)            24(17)        9(0)        16(2)        16(0)        16(0)        10(0)        10(0)       22(11)
           LOW             L.002          6.          L0.           .6          .04          .79        8.433           .0
          HIGH              .004         11.         36.0          6.7         7.54         3.11       63.261          6.7
       AVERAGE              .002*        7.8         28.8*         2.4         1.77         1.81       23.172          2.4*
      STD.DEV.              .001*        1.7         11.1*         1.8         2.04          .79       16.109          2.3*
  PERCNT:10TH              L.002                     L1.0           .6          .07         1.00        8.459           .0
          25TH             L.002         6.4         30.0          1.1          .68         1.25       10.432           0.
    MEDIAN 50TH            L.002          7.         33.0          1.9         1.04         1.42       21.347         L4.2
          75TH              .003          9.         35.0          3.7         1.98         2.67       26.888         L4.2
          90TH              .003                     35.4          4.7         5.50         2.91       46.950         L4.2
SECONDARY CODE            37L

                          10101L       06301L       06201L       17203L       16306L       09107L       14102L       10602L
                        ALKALINITY   CARBONATE    BICARBONT.    CHLORIDE     SULPHATE     FLUORIDE      SILICA      HARDNESS
                          TOTAL       (CALCD.)      (CALCD.)    DISSOLVED    DISSOLVED    DISSOLVED    REACTIVE       TOTAL
                                                                                                                   (CALCD.)
                   SUBM    CACO3         CO3         HCO3           CL         SO4            F          SIO2         CACO3
                    ID     MG/L         MG/L       MG/L           MG/L        MG/L         MG/L         MG/L          MG/L
SAMPLES(FLAGS)            24(0)        22(11)       22(11)       24(23)       24(1)        24(0)        24(0)        24(0)
           LOW             113.           0.        Q128.          L.0          L5.          .10          1.8         115.
          HIGH             149.           8.         182.          3.0          53.          .15          5.9         180.
       AVERAGE             132.           3.*        155.*         1.0*         34.*         .13          3.8         148.
      STD.DEV.              9.            3.*         13.*          .5*          9.*         .01          1.0          14.
  PERCNT:10TH              121.           0.        Q142.          L0.          25.          .11          2.3         136.
          25TH             127.           0.        Q146.         L1.0          30.          .12          3.1         139.
    MEDIAN 50TH            131.           5.         154.         L1.0          35.          .13          3.8         147.
          75TH             137.          Q5.         163.         L1.0          40.          .14          4.5         155.
          90TH             147.          Q5.        Q170.          L0.          45.          .15          5.0         168.
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  50                          NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                          SURFACE WATER DATA
STATION 00AL05EB2221     LAT. 53D 34M 28S  LONG. 113D 23M 18S   PR 3   UTM 12 341850E 5938600N  FOR MAY 18, 1982 TO FEB 29, 1984
 NORTH SASKATCHEWAN RIVER     LEFT BANK     BEVERLY RAILWAY TRESTLE
 180M DOWNSTREAM

                          20110L      12102L      11103L      19103L      15406L      15419L      07403L      07602L
                          CALCIUM    MAGNESIUM    SODIUM    POTASSIUM  PHOSPHOROUS  PHOSPHORUS   NITROGEN    NITROGEN
                         DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED     TOTAL       TOTAL     TOTAL ORG.    TOTAL
                                                                        PHOSPHATE   PHOSPHATE    (CALCD.)    (CALCD.)
                  SUBM       CA          MG          NA          K           P           P           N           N
                   ID       MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)             24(0)       24(0)       24(0)       24(0)       10(0)       12(0)       12(12)      24(22)
           LOW               33.          8.          2.          .5        .012        .008       Q.100       Q.170
          HIGH               49.         14.          8.         1.2        .15         .164       Q.200       Q.650
       AVERAGE               41.         11.2         4.8         .8        .048        .038                    .425*
      STD.DEV.                4.          1.3         1.4         .2        .049        .045                    .169*
  PERCNT:10TH                38.         10.          3.          .6        .013        .008       Q.100        .190
          25TH               39.         10.0         4.0         .7        .014        .012        .100        .240
   MEDIAN 50TH               41.         11.0         5.0         .8        .026        .019        .100        .550
          75TH               43.         12.0         6.0         .9        .06         .049        .100        .550
          90TH               46.         13.          6.0        1.1        .137        .076       Q.100       Q.570
SECONDARY CODE                                                                          21L

                          07021L      07503L      07562L      07205L      07206L      07105L      07906L      10407L
                         NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    RESIDUE
                           TOTAL       TOTAL     DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED  PARTICULATE NONFILTRABLE
                         KJELDAHL     AMMONIA     AMMONIA     NITRITE     NITRITE    NO3 & NO2     TOTAL
                  SUBM       N           N           N           N           N           N           N
                   ID       MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)             24(11)      12(12)      12(0)       24(24)      12(12)      24(21)      16(5)       17(0)
           LOW              .120        L.4         .006        L.05        L.007       L.05        L.01          5.
          HIGH              .6          L.4         .120        L.050       L.007        .15         .32        154.
       AVERAGE              .369*                   .027                                 .056*       .079*       28.
      STD.DEV.              .166*                   .032                                 .021*       .100*       38.
  PERCNT:10TH               .140        L.4         .006        L.05        L.007       L.05        L.01          5.
          25TH              .190        L.40        .007        L.050       L.007       L.050       L.010         8.
   MEDIAN 50TH             L.500        L.40        .019        L.050       L.007       L.050        .040        12.
          75TH             L.500        L.40        .032        L.050       L.007       L.050        .095        22.
          90TH             L.5          L.4         .040        L.05        L.007        .060        .32         73.
SECONDARY CODE             01L

                          10474L      10453L      00205L      36001L      36011L      36102L      36910L      29009L
                          RESIDUE     RESIDUE      TOTAL     COLIFORMS   COLIFORMS    STREP.    STD. PLATE    COPPER
                           TOTAL    FILTRABLE    DISSOLVED     TOTAL       FECAL       FECAL       COUNT       TOTAL
                                                  SOLIDS                                         BACT.DENS.
                  SUBM                                          MPN         MPN         MF                     CU
                   ID       MG/L        MG/L        MG/L     NO/100ML    NO/100ML    NO/100ML      NO/ML       MG/L
SAMPLES(FLAGS)             17(0)       17(0)       24(0)       21(0)       21(1)       21(0)       20(0)       24(13)
           LOW              176.        170.        120.        200.        L10.         10.         80.       L.001
          HIGH              384.        310.        206.      14000.       2900.        820.      54000.        .007
       AVERAGE              267.        239.        172.       2704.        440.*       136.       4197.        .002*
      STD.DEV.               50.         32.         17.       3424.        741.*       177.      12236.        .002*
  PERCNT:10TH               218.        210.        160.        320.         50.         20.        155.       L.001
          25TH              241.        220.        162.        800.         76.         30.        260.       L.001
   MEDIAN 50TH              258.        230.        174.       1200.        170.         78.        550.       L.001
          75TH              282.        260.        184.       2900.        310.        180.       1015.        .003
          90TH              333.        280.        188.       7800.        810.        250.       9650.        .006
SECONDARY CODE                                              02L         12L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  51                    NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                      SURFACE WATER DATA
STATION 00AL05EB2221    LAT. 53D 34M 28S  LONG. 113D 23M 18S   PR 3   UTM 12 341850E 5938600N  FOR MAY 18, 1982 TO FEB 29, 1984
 NORTH SASKATCHEWAN RIVER     LEFT BANK     BEVERLY RAILWAY TRESTLE
 180M DOWNSTREAM

                      30009L      26304L      13306L      25003L      28009L      42009L      27009L      33005L
                       ZINC        IRON      ALUMINUM   MANGANESE     NICKEL    MOLYBDENUM    COBALT      ARSENIC
                      TOTAL      EXTRBLE.    EXTRBLE.     TOTAL       TOTAL       TOTAL       TOTAL      TOTAL

                SUBM   ZN          FE          AL          MN          NI          MO          CO          AS
                 ID   MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)        24(2)       24(0)       20(0)       21(5)       24(4)       20(17)      24(22)      16(2)
           LOW        L.001         .05        .035       L.008       L.001       L.001       L.001      L.0002
          HIGH         .054        1.57       4.110        .135        .013        .007        .005        .003
       AVERAGE         .017*        .37        .668        .027*       .005*       .002*       .001*      .0007*
      STD.DEV.         .015*        .39       1.107        .031*       .003*       .002*       .001*      .0007*
   PERCNT:10TH         .002         .07        .060       L.008       L.001       L.001       L.001      L.0002
          25TH         .004         .12        .105        .009        .003       L.001       L.001       .0004
   MEDIAN 50TH         .013         .20        .210        .013        .004       L.001       L.001       .0005
          75TH         .029         .59        .501        .031        .006       L.001       L.001       .0008
          90TH         .041         .90       2.560        .047        .011        .005       L.001       .0011
SECONDARY CODE

                      04304L      48009L      24009L      82302L      82009L      80015L      34005L      23009L
                     BERYLLIUM    CADMIUM    CHROMIUM      LEAD        LEAD      MERCURY    SELENIUM    VANADIUM
                      EXTRBLE.     TOTAL       TOTAL     EXTRBLE.      TOTAL       TOTAL     TOTAL         TOTAL

                SUBM   BE          CD          CR          PB          PB          HG          SE          V
                 ID   MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)        20(20)      24(20)      24(7)        9(6)       12(9)       12(12)      16(15)      19(10)
           LOW        L.001       L.001       L.001       L.003       L.003      L.0001      L.0002       L.002
          HIGH        L.001        .003        .013        .010        .018      L.0001       .0003        .020
       AVERAGE                     .001*       .004*       .004*       .004*                  .0002*       .005*
      STD.DEV.                     .001*       .003*       .002*       .004*                  .0000*       .005*
   PERCNT:10TH        L.001       L.001       L.001                   L.003      L.0001      L.0002       L.002
          25TH        L.001       L.001       L.001       L.003       L.003      L.0001      L.0002       L.002
   MEDIAN 50TH        L.001       L.001        .004       L.003       L.003      L.0001      L.0002       L.002
          75TH        L.001       L.001        .005        .005        .003*     L.0001      L.0002        .005
          90TH        L.001        .002        .008                    .004      L.0001      L.0002        .014
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  52                     NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                      SURFACE WATER DATA
STATION 00AL05EB2222    LAT. 53D 34M 25S  LONG. 113D 23M 14S   PR 3   UTM 12 341950E 5938500N  FOR MAY 18, 1982 TO NOV 15, 1983
 NORTH SASKATCHEWAN RIVER       CENTRE     BEVERLY RAILWAY TRESTLE
 180M DOWNSTREAM

                    97251F        02065F        08102F        02042F        02041L        10301L        08202L        08301L
                  DEPTH OF     TEMPERATURE      OXYGEN       SPECIFIC      SPECIFIC         PH          OXYGEN        OXYGEN
                  SAMPLING        WATER       DISSOLVED      CONDUCT.      CONDUCT.                    BIOCHEM.     TOTAL COD
                                                                                                      DEMAND-BOD
               SUBM FROM SURF.                    O2                                                      O2            O2
                ID       M        DEG.C          MG/L        USIE/CM        US/CM        PH UNITS        MG/L          MG/L
SAMPLES(FLAGS)           16(0)         22(0)         22(0)         20(0)         22(0)         22(0)         19(4)         22(2)
           LOW             1.1            1.           6.2           30.          267.           7.7           L.3          L5.0
          HIGH             2.7          24.0          14.5          405.          372.           8.4           3.1          39.3
       AVERAGE             2.0          14.0           9.7          340.          328.                         1.4*         14.8*
      STD.DEV.              .4           6.5           2.0           80.           25.                          .9*          9.9*
   PERCNT:10TH             1.5            5.           7.9          305.          293.           8.0           L.3           5.9
          25TH             1.7           8.1           8.5          325.          318.           8.2            .7           7.5
   MEDIAN 50TH             1.9          16.0           8.9          350.          332.           8.2           1.3          12.5
          75TH             2.1           19.          11.2          390.          342.           8.3           1.9           16.
          90TH             2.7          19.5          12.4          398.          360.           8.4           2.7          32.8
SECONDARY CODE                                                                                                          04L

                    06536L        06005L        06154L        06107L        06905L        06715L        06721L        10151L
                  PHENOLIC        CARBON        CARBON        CARBON        CARBON       CHLORO -    CHLOROPHYLL    ALKALINITY
                  MATERIAL        TOTAL       DISSOLVED     DISSOLVED    PARTICULATE     PHYLL A         -A-          PHENOL
                   PHENOL        ORGANIC      INORGANIC      ORGANIC        TOTAL                     EPILITHON     PHTHALEIN
               SUBM                 C             C             C             C                                       CACO3
                ID    MG/L         MG/L          MG/L          MG/L          MG/L         MG/M3         MG/M2          MG/L
SAMPLES(FLAGS)          22(12)         11(0)         10(0)         10(0)         10(0)         10(0)                       22(5)
           LOW           L.002           4.7          29.0            .8           .25           .82                          .0
          HIGH            .005           10.          35.0           7.6          7.34          3.24                        L4.2
       AVERAGE            .002*          7.8          32.3           2.8          1.92          2.04                         1.0*
      STD.DEV.            .001*          1.8           2.3           2.2          2.14           .93                         1.8*
   PERCNT:10TH           L.002            6.          29.0            .9           .34           .97                          .0
          25TH           L.002           6.4          30.0           1.1           .75          1.30                          .0
   MEDIAN 50TH           L.002            8.          32.5           1.9          1.25          1.74                          .0
          75TH            .003           9.5          34.0           4.0          2.40          3.06                          .0
          90TH            .004           9.6          35.0           6.4          5.42          3.20                        L4.2
SECONDARY CODE         37L

                    10101L        06301L        06201L        17203L        16306L        09107L        14102L        10602L
                 ALKALINITY     CARBONATE     BICARBONT.     CHLORIDE      SULPHATE      FLUORIDE       SILICA       HARDNESS
                   TOTAL         (CALCD.)      (CALCD.)     DISSOLVED     DISSOLVED     DISSOLVED      REACTIVE        TOTAL
                                                                                                                    (CALCD.)
               SUBM   CACO3        CO3           HCO3           CL           SO4            F            SIO2         CACO3
                ID    MG/L         MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)           22(0)         22(5)         22(5)        22(13)         22(0)         22(0)         22(0)         22(0)
           LOW            114.            0.         Q135.           L0.           20.           .11           2.4          110.
          HIGH            147.           Q5.          178.            3.           50.           .18           6.3          171.
       AVERAGE            132.            1.*        158.*          1.5*          36.           .14           4.0          149.
      STD.DEV.              9.            2.*         12.*           .7*           8.           .02            .9           14.
   PERCNT:10TH            119.            0.          143.           L0.           25.           .12           2.9          134.
          25TH            126.            0.          152.           L0.           31.           .13           3.5          141.
   MEDIAN 50TH            131.            0.          157.          L1.0           37.           .14           3.9          150.
          75TH            137.            0.          167.            2.           40.           .15           4.5          158.
          90TH            146.           Q5.          178.            2.           45.           .17           5.0          167.
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  53                      NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                        SURFACE WATER DATA
STATION 00AL05EB2222    LAT. 53D 34M 25S  LONG. 113D 23M 14S   PR 3   UTM 12 341950E 5938500N  FOR MAY 16, 1982 TO NOV 15, 1983
 NORTH SASKATCHEWAN RIVER        CENTRE     BEVERLY RAILWAY TRESTLE
 180M DOWNSTREAM

                          20110L      12102L      11103L      19103L      15406L      15419L      07403L      07602L
                          CALCIUM    MAGNESIUM    SODIUM     POTASSIUM  PHOSPHOROUS PHOSPHORUS   NITROGEN    NITROGEN
                         DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED     TOTAL       TOTAL    TOTAL ORG.    TOTAL
                                                                         PHOSPHATE   PHOSPHATE   (CALCD.)    (CALCD.)
                 SUBM       CA          MG          NA          K            P           P           N           N
                  ID       MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)             22(0)       22(0)       22(0)       22(0)       10(0)       15(0)       12(11)      22(15)
           LOW              31.          8.          2.          .6        .027        .024       Q.100       Q.250
          HIGH              47.         14.          9.         1.9        .161        .188        .200        .960
       AVERAGE              41.         11.3        5.5         1.0        .082        .083        .117*       .556*
      STD.DEV.               4.          1.5        1.9          .3        .047        .052        .039*       .180*
  PERCNT:10TH               37.         10.          4.          .7        .029        .031       Q.100        .280
          25TH              40.         10.          4.          .8        .05         .035        .100        .450
 MEDIAN   50TH              41.         11.0        5.0          .9        .068        .064        .100        .550
          75TH              42.         12.          7.         1.1        .13         .125        .100       Q.650
          90TH              46.         13.          9.         1.3        .148        .176       Q.200       Q.770
SECONDARY CODE                                                                         21L

                          07021L      07503L      07562L      07205L      07206L      07105L      07906L      10407L
                          NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    RESIDUE
                           TOTAL       TOTAL     DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED  PARTICULATE NONFILTRABLE
                          KJELDAHL    AMMONIA     AMMONIA     NITRITE     NITRITE    NO3 & NO2    TOTAL
                 SUBM        N           N           N           N           N           N           N
                  ID       MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)             22(6)       12(11)      15(1)       22(21)      12(11)      22(14)      10(3)       15(0)
           LOW             .190        L.4         L.002       L.05        L.007       L.05        L.01          6.
          HIGH             .720         .5          .500        .06         .021        .40         .33        161.
       AVERAGE             .405*        .41*        .122*       .050*       .008*       .097*       .099*       29.
      STD.DEV.             .167*        .03*        .134*       .002*       .004*       .093*       .104*       40.
  PERCNT:10TH              .200        L.4          .031       L.05        L.007       L.05        L.010         6.
          25TH             .270        L.40         .051       L.05        L.007       L.05        L.01          9.
 MEDIAN   50TH             .415        L.40         .059       L.050       L.007       L.050        .060        13.
          75TH             L.5         L.40         .126       L.05        L.007        .10         .13         39.
          90TH             .600        L.4          .360       L.05        L.007        .25         .270        53.
SECONDARY CODE             01L

                          10474L      10453L      00205L      36001L      36011L      36102L      36910L      29009L
                          RESIDUE     RESIDUE      TOTAL     COLIFORMS   COLIFORMS    STREP.    STD. PLATE    COPPER
                           TOTAL     FILTRABLE   DISSOLVED     TOTAL       FECAL       FECAL       COUNT       TOTAL
                                                  SOLIDS                                        BACT.DENS.
                 SUBM                                          MPN         MPN          MF                      CU
                  ID       MG/L        MG/L        MG/L      NO/100ML    NO/100ML    NO/100ML     NO/ML        MG/L
SAMPLES(FLAGS)             15(0)       15(0)       22(0)       22(0)       22(0)       22(0)       21(0)       22(10)
           LOW             206.        200.        133.        510.         30.         20.         29.       L.001
          HIGH             411.        310.        207.      66000.      33000.       1400.      22000.        .008
       AVERAGE             287.        259.        176.      10546.       2915.        290.       3879.        .003*
      STD.DEV.              49.         30.         16.      15026.       7398.        325.       5640.        .002*
  PERCNT:10TH              223.        210.        160.       1300.        180.         50.        300.       L.001
          25TH             255.        240.        165.       2800.        340.         90.        380.       L.001
 MEDIAN   50TH             289.        260.        179.       5150.        580.        165.       1100.        .002
          75TH             316.        280.        185.      11000.       1700.        350.       3900.        .004
          90TH             323.        290.        191.      17000.       2500.        610.      10000.        .006
SECONDARY CODE                                               02L         12L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  54                    NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                      SURFACE WATER DATA
STATION 00AL05EB2222    LAT. 53D 34M 25S  LONG. 113D 23M 14S   PR 3   UTM 12 341950E 5938500N  FOR MAY 18, 1982 TO NOV 15, 1983
 NORTH SASKATCHEWAN RIVER        CENTRE      BEVERLY RAILWAY TRESTLE
 180M DOWNSTREAM

                          30009L      26304L      13306L      25003L      28009L      42009L      27009L      33005L
                           ZINC        IRON      ALUMINUM   MANGANESE     NICKEL   MOLYBDENUM    COBALT     ARSENIC
                          TOTAL      EXTRBLE.    EXTRBLE.     TOTAL       TOTAL       TOTAL       TOTAL      TOTAL

                  SUBM     ZN          FE          AL          MN          NI          MO          CO          AS
                   ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            22(1)       22(0)       18(0)       19(3)       22(3)       18(16)      22(17)      14(3)
           LOW            L.001         .05        .045       L.008       L.001       L.001       L.001      L.0002
          HIGH             .045        1.58       4.080        .114        .015        .006        .004       .0022
       AVERAGE             .019*        .40        .683        .028*       .005*       .001*       .001*      .0006*
      STD.DEV.             .013*        .40       1.171        .030*       .003*       .001*       .001*      .0005*
   PERCNT:10TH             .004         .07        .050       L.008       L.001       L.001       L.001      L.0002
          25TH             .006         .13        .090        .009        .003       L.001       L.001       .0003
    MEDIAN 50TH            .018         .22        .190        .015        .006       L.001       L.001       .0004
          75TH             .029         .52        .459        .042        .007       L.001       L.001       .0008
          90TH             .036        1.02       3.430        .089        .008        .004        .003       .0009
SECONDARY CODE

                          04304L      48009L      24009L      82302L      82009L      80015L      34005L      23009L
                        BERYLLIUM    CADMIUM    CHROMIUM      LEAD        LEAD      MERCURY    SELENIUM    VANADIUM
                         EXTRBLE.     TOTAL       TOTAL      EXTRBLE.     TOTAL       TOTAL      TOTAL       TOTAL

                  SUBM     BE          CD          CR          PB          PB          HG          SE          V
                   ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            18(18)      22(17)      22(4)       7(5)        12(5)       10(10)      14(13)      17(8)
           LOW            L.001       L.001       L.001       L.003       L.003       L.0001      L.0002      L.002
          HIGH            L.001        .004        .013        .005        .040       L.0001       .0003       .015
       AVERAGE                         .001*       .005*       .003*       .009*                   .0002*      .004*
      STD.DEV.                         .001*       .003*       .001*       .011*                   .0000*      .004*
   PERCNT:10TH            L.001       L.001       L.001                   L.003       L.0001      L.0002      L.002
          25TH            L.001       L.001        .003       L.003       L.003       L.0001      L.0002      L.002
    MEDIAN 50TH           L.001       L.001        .005       L.003        .004       L.0001      L.0002       .003
          75TH            L.001       L.001        .007        .004        .008       L.0001      L.0002       .004
          90TH            L.001        .003        .008                    .020       L.0001      L.0002       .011
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  55                    NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                      SURFACE WATER DATA
STATION 00AL05EB2223    LAT. 53D 34M 25S  LONG. 113D 23M 11S   PR 3   UTM 12 342000E 5938500N  FOR MAY 18, 1982 TO FEB 29, 1984
 NORTH SASKATCHEWAN RIVER   RIGHT BANK      BEVERLY RAILWAY TRESTLE
 180M DOWNSTREAM

                        97251F       02065F       08102F       02042F       02041L       10301L       08202L       08301L
                       DEPTH OF   TEMPERATURE     OXYGEN      SPECIFIC     SPECIFIC        PH         OXYGEN       OXYGEN
                       SAMPLING      WATER      DISSOLVED     CONDUCT.     CONDUCT.                 BIOCHEM.     TOTAL COD
                                                                                                   DEMAND-BOD
                  SUBM  FROM SURF.                  O2                                                 O2           O2
                   ID       M         DEG.C        MG/L        USIE/CM       US/CM      PH UNITS       MG/L         MG/L
SAMPLES(FLAGS)            19(0)       23(0)        23(0)        21(0)        24(0)       23(0)         22(3)        23(2)
           LOW               .3          .6          5.6           4.         278.         6.7           L.3         L5.0
          HIGH              2.1        24.5         14.8         450.         427.         8.4           4.9         28.0
       AVERAGE               .8        13.8         10.0         377.         367.                       2.3*        13.1*
      STD.DEV.               .4         6.7          2.2          95.          33.                       1.4*         6.5*
  PERCNT:10TH                .5         2.0          8.3         330.         324.         7.8            .6          5.6
          25TH               .6         8.5          8.4         355.         352.         7.9           1.0          7.9
   MEDIAN 50TH               .6         16.          9.4         390.         379.         8.1           2.2          14.
          75TH               .9         19.         11.5         440.         389.         8.2           3.6          15.
          90TH              1.5         20.          13.         450.         392.         8.4           4.2          23.
SECONDARY CODE                                                                                                    04L

                        06536L       06005L       06154L       06107L       06905L       06715L       06721L       10151L
                       PHENOLIC      CARBON       CARBON       CARBON       CARBON      CHLORO -   CHLOROPHYLL   ALKALINITY
                       MATERIAL      TOTAL      DISSOLVED    DISSOLVED   PARTICULATE    PHYLL A        -A-         PHENOL
                        PHENOL      ORGANIC     INORGANIC     ORGANIC       TOTAL                  EPILITHON    PHTHALEIN
                  SUBM                  C            C            C            C                                  CACO3
                   ID    MG/L         MG/L         MG/L         MG/L         MG/L        MG/M3         MG/M2        MG/L
SAMPLES(FLAGS)           23(8)        10(0)        12(0)        12(0)        12(2)       10(0)          9(0)        22(3)
           LOW           L.002          7.5         29.0          1.1         L.01        1.50        26.310           .0
          HIGH            .012          11.         36.0          8.0         7.89        8.68        376.73         L4.2
       AVERAGE            .004*         9.4         33.0          2.7         1.71*       4.36        94.928           .6*
      STD.DEV.            .002*         1.6          2.3          2.1         2.33*       2.52       109.583          1.5*
  PERCNT:10TH            L.002          7.6         30.0          1.2         L.01        1.75                         .0
          25TH           L.002          7.8         31.0          1.4          .52        2.21        36.784           .0
   MEDIAN 50TH            .003          9.5         33.5          1.7          .80        3.75        72.632           .0
          75TH            .004          11.         35.0          3.5         1.56        6.72         80.55           .0
          90TH            .006         11.0         35.0          5.7         4.87        8.03                       L4.2
SECONDARY CODE           37L

                        10101L       06301L       06201L       17203L       16306L       09107L       14102L       10602L
                      ALKALINITY   CARBONATE    BICARBONT.    CHLORIDE     SULPHATE     FLUORIDE      SILICA      HARDNESS
                         TOTAL      (CALCD.)      (CALCD.)    DISSOLVED    DISSOLVED    DISSOLVED    REACTIVE       TOTAL
                                                                                                                (CALCD.)
                  SUBM   CACO3         CO3         HCO3           CL          SO4           F          SIO2         CACO3
                   ID    MG/L         MG/L        MG/L           MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)           24(0)        22(3)         22(3)        24(2)        24(0)        24(0)        24(0)        24(0)
           LOW            115.           0.          140.          L0.          20.          .13          2.7         123.
          HIGH            151.          Q5.          184.          14.          60.          .28          6.7         178.
       AVERAGE            134.           1.*         161.*          5.3*        43.          .19          4.2         155.
      STD.DEV.             10.           2.*          13.*          3.2*         9.          .03           .9          14.
  PERCNT:10TH             120.           0.         Q146.           2.          35.          .15          2.8         139.
          25TH            127.           0.          151.          3.0          39.          .17          3.7         148.
   MEDIAN 50TH            134.           0.          162.          5.0          45.          .18          4.1         152.
          75TH            140.           0.          171.          7.0          48.          .21          4.5         168.
          90TH            148.          Q5.          180.          10.          55.          .22          5.1         174.
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  56                    NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                       SURFACE WATER DATA
STATION 00AL05EB2223    LAT. 53D 34M 25S  LONG. 113D 23M 11S   PR 3   UTM 12 342000E 5938500N  FOR MAY 18, 1982 TO FEB 29, 1984
 NORTH SASKATCHEWAN RIVER   RIGHT BANK     BEVERLY RAILWAY TRESTLE
 180M DOWNSTREAM

                         20110L       12102L       11103L       19103L       15406L       15419L       07403L       07602L
                         CALCIUM      MAGNESIUM    SODIUM       POTASSIUM    PHOSPHOROUS  PHOSPHORUS   NITROGEN     NITROGEN
                         DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED    TOTAL        TOTAL        TOTAL ORG.   TOTAL
                                                                             PHOSPHATE    PHOSPHATE    (CALCD.)     (CALCD.)
                   SUBM  CA           MG           NA           K            P            P            N            N
                    ID   MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)           24(0)        24(0)        24(0)        24(0)        10(0)        17(0)        11(3)        23(3)
           LOW             36.           8.           3.           .7         .077         .023        Q.100         .550
          HIGH             53.          15.          15.          2.3         .424         .480         .800        1.940
       AVERAGE             43.         11.7         10.3          1.4         .242         .231         .382*       1.189*
      STD.DEV.              4.          1.4          2.9           .3         .128         .122         .223*        .394*
   PERCNT:10TH             38.          10.           6.          1.0         .087         .050         .200         .600
          25TH             40.         11.0          8.0          1.2          .13         .151         .200         .850
   MEDIAN 50TH             42.         12.0         11.0          1.3         .259         .250         .300        1.250
          75TH             46.         12.0         12.0          1.5         .334         .310         .500        1.530
          90TH             47.         13.0          13.          1.8         .422         .380         .700        1.580
SECONDARY CODE                                                                            21L

                         07021L       07503L       07562L       07205L       07206L       07105L       07906L       10407L
                         NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN     RESIDUE
                         TOTAL        TOTAL        DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED    PARTICULATE  NONFILTRABLE
                         KJELDAHL     AMMONIA      AMMONIA      NITRITE      NITRITE      NO3 & NO2    TOTAL
                   SUBM  N            N            N            N            N            N            N
                    ID   MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)           23(0)        11(3)        17(0)        24(18)       11(2)        24(3)        12(3)        17(0)
           LOW            .320          L.4         .031         L.05        L.007         L.05         L.01           5.
          HIGH           1.440           .9        1.130          .39         .048         1.06          .42         216.
       AVERAGE            .954          .60*        .601         .071*        .025*        .229*        .117*         32.
      STD.DEV.            .315          .17*        .370         .070*        .017*        .232*        .136*         53.
   PERCNT:10TH              .5          L.4         .045         L.05        L.007         L.05         L.01           7.
          25TH            .810          L.4         .300        L.050         .007         .090         .010*         10.
   MEDIAN 50TH            .940           .6         .672        L.050         .029         .150         .075          11.
          75TH           1.240           .7         .870         .055*         .04         .275         .170          24.
          90TH           1.360           .8        1.120          .10         .046          .50          .33         109.
SECONDARY CODE           01L

                         10474L       10453L       00205L       36001L       36011L       36102L       36910L       29009L
                         RESIDUE      RESIDUE      TOTAL        COLIFORMS    COLIFORMS    STREP.       STD. PLATE   COPPER
                         TOTAL        FILTRABLE    DISSOLVED    TOTAL        FECAL        FECAL        COUNT        TOTAL
                                                   SOLIDS                                              BACT.DENS.
                   SUBM                                         MPN          MPN          MF                        CU
                    ID   MG/L         MG/L         MG/L         NO/100ML     NO/100ML     NO/100ML     NO/ML        MG/L
SAMPLES(FLAGS)           17(0)        17(0)        24(0)        21(0)        21(0)        21(0)        20(0)        24(9)
           LOW            204.         190.         144.        2400.         320.          20.          31.        L.001
          HIGH            536.         360.         226.       94000.       30000.        2200.       30000.         .008
       AVERAGE            294.         268.         195.       21129.        4726.         470.        6687.         .003*
      STD.DEV.             77.          43.          18.       20439.        8231.         489.        7191.         .002*
   PERCNT:10TH            227.         220.         177.        7400.         830.          40.        1450.        L.001
          25TH            251.         230.         185.       10000.         990.         170.        1700.        L.001
   MEDIAN 50TH            281.         270.         196.       15000.        1900.         440.        4000.         .002
          75TH            318.         290.         208.       22000.        2900.         620.        9200.         .003
          90TH            376.         320.         214.       38000.        7000.         800.       15000.         .006
SECONDARY CODE                                                 02L          12L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  57                     NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                      SURFACE WATER DATA
STATION 00AL05EB2223    LAT. 53D 34M 25S  LONG. 113D 23M 11S   PR 3   UTM 12 342000E 5938500N  FOR MAY 18, 1982 TO FEB 29, 1984
 NORTH SASKATCHEWAN RIVER   RIGHT BANK      BEVERLY RAILWAY TRESTLE
 180M DOWNSTREAM
                          30009L        26304L       13306L      25003L       28009L      42009L       27009L       33005L
                           ZINC          IRON       ALUMINUM    MANGANESE     NICKEL    MOLYBDENUM     COBALT       ARSENIC
                          TOTAL        EXTRBLE.     EXTRBLE.      TOTAL       TOTAL       TOTAL        TOTAL        TOTAL

                  SUBM     ZN            FE           AL           MN           NI          MO           CO           AS
                   ID     MG/L          MG/L         MG/L         MG/L         MG/L        MG/L         MG/L         MG/L
SAMPLES(FLAGS)            24(0)         24(0)        20(0)        21(0)        24(0)       20(19)       24(21)       17(2)
           LOW             .004          .03         .050         .011         .003       L.001        L.001        L.0002
          HIGH             .065         1.70        4.200         .119         .012        .004         .004         .0018
       AVERAGE             .020          .39         .631         .031         .006        .001*        .001*        .0007*
      STD.DEV.             .016          .45        1.121         .032         .002        .001*        .001*        .0004*
   PERCNT:10TH             .005          .09         .071         .012         .004       L.001        L.001        L.0002
          25TH             .008          .12         .098         .014         .004       L.001        L.001         .0005
   MEDIAN 50TH             .014          .21         .171         .015         .006       L.001        L.001         .0007
          75TH             .033          .45         .423         .024         .008       L.001        L.001         .0007
          90TH             .043         1.26        2.395         .086         .008       L.001         .002         .0009
SECONDARY CODE
                          04304L        48009L       24009L      82302L       82009L      80015L       34005L       23009L
                         BERYLLIUM     CADMIUM      CHROMIUM      LEAD         LEAD      MERCURY      SELENIUM     VANADIUM
                          EXTRBLE.      TOTAL        TOTAL      EXTRBLE.      TOTAL       TOTAL       TOTAL         TOTAL

                  SUBM     BE            CD           CR           PB           PB          HG           SE           V
                   ID     MG/L          MG/L         MG/L         MG/L         MG/L        MG/L         MG/L         MG/L
SAMPLES(FLAGS)            20(20)        24(21)       24(2)        10(7)        12(6)       12(12)       17(12)       19(10)
           LOW            L.001         L.001        L.001        L.003        L.003       L.0001       L.0002       L.002
          HIGH            L.001          .002         .057         .007         .084       L.0001        .0007        .015
       AVERAGE                           .001*        .009*        .004*        .011*                    .0003*       .004*
      STD.DEV.                           .000*        .011*        .001*        .023*                    .0001*       .003*
   PERCNT:10TH            L.001         L.001         .003        L.003        L.003       L.0001       L.0002       L.002
          25TH            L.001         L.001         .005        L.003        L.003       L.0001       L.0002       L.002
   MEDIAN 50TH            L.001         L.001         .006        L.003         .003*      L.0001       L.0002       L.002
          75TH            L.001         L.001         .011         .004         .006       L.0001        .0003        .004
          90TH            L.001          .002         .017         .007         .008       L.0001        .0003        .010
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE   1                       NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                          SURFACE WATER DATA
STATION 00AL05EB2301    LAT. 53D 36M 33S  LONG. 113D 20M 36S   PR 3   UTM 12 344950E 5942350N  FOR MAY 18, 1982 TO NOV 02, 1982
 NORTH SASKATCHEWAN RIVER     LEFT BANK     DOWNSTREAM OF CLOVERBAR POWER PLANT
 NEAR POWER TRANSMISSION LINES

                          97251F      02065F       08102F      02042F      02041L       10301L       08202L       08301L
                         DEPTH OF   TEMPERATURE    OXYGEN     SPECIFIC    SPECIFIC        PH         OXYGEN       OXYGEN
                         SAMPLING      WATER     DISSOLVED    CONDUCT.    CONDUCT.                   BIOCHEM.    TOTAL COD
                 SUBM   FROM SURF.                                                                 DEMAND-BOD
                  ID        M                        02                                                 02           02
                                       DEG.C        MG/L      USIE/CM      US/CM      PH UNITS        MG/L         MG/L
SAMPLES(FLAGS)            12(0)        12(0)       12(0)       12(0)       12(0)       12(0)         13(2)        11(0)
           LOW               .8          1.           7.9        280.        264.         8.1          L.3          7.9
          HIGH              2.4         20.5        15.          410.        354.         8.6          4.          25.
       AVERAGE              1.5         14.4        10.2         353.        321.                      1.4*         13.2
      STD.DEV.               .5          6.3         2.2          41.         26.                      1.1*          5.0
  PERCNT:10TH                .9          5.          8.4         310.        293.         8.2          L.3          8.
          25TH              1.2         11.0         8.6         320.        306.         8.3           .6          8.4
   MEDIAN 50TH              1.5         16.3         9.4         360.        325.         8.4           .9         12.
          75TH              1.9         19.0        11.7         388.        340.         8.4          2.2         15.
          90TH              2.3         19.5        12.8         395.        348.         8.4          2.5         18.
SECONDARY CODE

                          06536L      06005L       06154L      06107L      06905L       06715L       06721L       10151L
                         PHENOLIC     CARBON       CARBON      CARBON      CARBON      CHLORO -    CHLOROPHYLL  ALKALINITY
                         MATERIAL     TOTAL      DISSOLVED   DISSOLVED  PARTICULATE    PHYLL A        -A-         PHENOL
                          PHENOL     ORGANIC     INORGANIC    ORGANIC     TOTAL                    EPILITHON    PHTHALEIN
                SUBM                    C            C           C          C                                   CACO3
                 ID        MG/L       MG/L         MG/L        MG/L        MG/L         MG/M3        MG/M2         MG/L
SAMPLES(FLAGS)            13(8)       11(0)                                                                     12(7)
           LOW            L.002         3.2                                                                        .0
          HIGH             .004        11.                                                                       L4.2
       AVERAGE             .002*        7.6                                                                       2.4*
      STD.DEV.             .001*        2.4                                                                       2.2*
  PERCNT:10TH             L.002         5.                                                                         .0
          25TH            L.002         6.                                                                         .0
   MEDIAN 50TH            L.002         8.                                                                       L4.2
          75TH             .002         9.7                                                                      L4.2
          90TH             .004        11.                                                                       L4.2
SECONDARY CODE

                          10101L      06301L       06201L      17203L      16306L       09107L       14102L       10602L
                        ALKALINITY   CARBONATE    BICARBONT.   CHLORIDE    SULPHATE    FLUORIDE      SILICA      HARDNESS
                          TOTAL       (CALCD.)     (CALCD.)   DISSOLVED   DISSOLVED    DISSOLVED    REACTIVE       TOTAL
                                                                                                               (CALCD.)
                SUBM      CACO3         CO3        HCO3          CL          SO4          F           SIO2         CACO3
                 ID       MG/L         MG/L        MG/L         MG/L        MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)            12(0)        12(7)        12(7)       12(12)      12(0)        12(0)        12(0)        12(0)
           LOW             113.          0.         Q128.        L0.          20.          .12          3.0         110.
          HIGH             149.         Q5.          179.        L0.          45.          .15          5.4         168.
       AVERAGE             133.          3.*         156.*                    32.          .13          4.2         147.
      STD.DEV.              11.          3.*          15.*                     8.          .01           .7          15.
  PERCNT:10TH              117.          0.         Q132.        L0.          20.          .12          3.5         136.
          25TH             129.          0.          152.        L1.0         28.          .12          3.7         140.
   MEDIAN 50TH             133.          5.          157.        L1.0         34.          .13          4.1         150.
          75TH             142.          5.          167.        L1.0         38.          .14          4.5         156.
          90TH             147.         Q5.         Q171.        L0.          40.          .14          5.0         158.
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

REQUEST 0004 - 0006 PAGE 2

NAQUADAT SUMMARY REPORT APR 30, 1986
SURFACE WATER DATA

STATION 00AL05EB2301 LAT. 53D 36M 33S LONG. 113D 20M 36S PR 3 UTM 12 344950E 5942350N FOR MAY 18, 1982 TO NOV 02, 1982
NORTH SASKATCHEWAN RIVER LEFT BANK DOWNSTREAM OF CLOVERBAR POWER PLANT
NEAR POWER TRANSMISSION LINES

	20110L CALCIUM DISSOLVED	12102L MAGNESIUM DISSOLVED	11103L SODIUM DISSOLVED	19103L POTASSIUM DISSOLVED	15406L PHOSPHOROUS TOTAL PHOSPHATE	15419L PHOSPHORUS TOTAL PHOSPHATE	07403L NITROGEN TOTAL ORG. (CALCD.)	07602L NITROGEN TOTAL (CALCD.)
SUBM ID	CA	MG	NA	K	P	P	N	N
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
SAMPLES(FLAGS)	12(0)	12(0)	12(0)	12(0)	9(0)	5(0)	12(12)	12(12)
LOW	31.	8.	2.	.5	.016	.012	Q.100	Q.270
HIGH	49.	13.	6.	1.1	.165	.025	Q.300	Q.750
AVERAGE	41.	10.8	4.8	.9	.057	.021		
STD.DEV.	4.	1.3	1.1	.1	.058	.006		
PERCNT:10TH	38.	10.	4.	.8			Q.100	Q.550
25TH	40.	10.0	4.0	.8	.02	.021	.100	.550
MEDIAN 50TH	42.	11.0	5.0	.9	.023	.024	.100	.550
75TH	43.	11.5	5.5	.9	.093	.025	.100	.550
90TH	46.	12.	6.	1.0			Q.200	Q.570
SECONDARY CODE						21L		

	07021L NITROGEN TOTAL KJELDAHL	07503L NITROGEN TOTAL AMMONIA	07562L NITROGEN DISSOLVED AMMONIA	07205L NITROGEN DISSOLVED NITRITE	07206L NITROGEN DISSOLVED NITRITE	07105L NITROGEN DISSOLVED NO3 & NO2	07906L NITROGEN PARTICULATE TOTAL	10407L RESIDUE NONFILTRABLE
SUBM ID	N	N	N	N	N	N	N	
	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
SAMPLES(FLAGS)	13(6)	13(12)	5(0)	12(12)	13(13)	12(11)		5(0)
LOW	.140	L.4	.007	L.05	L.007	L.05		8.
HIGH	.7	.4	.029	L.05	L.007	.07		21.
AVERAGE	.400*	.40*	.017			.052*		13.
STD.DEV.	.191*	.00*	.010			.006*		5.
PERCNT:10TH	.150	L.4		L.05	L.007	L.05		
25TH	.210	L.4	.008	L.050	L.007	L.050		9.
MEDIAN 50TH	L.5	L.4	.020	L.050	L.007	L.050		14.
75TH	L.5	L.4	.023	L.050	L.007	L.050		15.
90TH	.6	L.4		L.05	L.007	L.05		
SECONDARY CODE	01L							

	10474L RESIDUE TOTAL	10453L RESIDUE FILTRABLE	00205L TOTAL DISSOLVED SOLIDS	36001L COLIFORMS TOTAL	36011L COLIFORMS FECAL	36102L STREP. FECAL	36910L STD. PLATE COUNT BACT.DENS.	29009L COPPER TOTAL
SUBM ID				MPN	MPN	MF		CU
	MG/L	MG/L	MG/L	NO/100ML	NO/100ML	NO/100ML	NO/ML	MG/L
SAMPLES(FLAGS)	5(0)	5(0)	12(0)	11(0)	11(0)	11(0)	11(0)	12(4)
LOW	174.	160.	133.	300.	30.	30.	27.	L.001
HIGH	299.	290.	193.	10000.	670.	290.	7200.	.006
AVERAGE	244.	230.	171.	2080.	217.	141.	1041.	.003*
STD.DEV.	56.	57.	17.	2773.	179.	88.	2075.	.002*
PERCNT:10TH			153.	680.	70.	40.	49.	L.001
25TH	195.	180.	162.	800.	130.	46.	160.	L.001
MEDIAN 50TH	259.	250.	174.	1100.	160.	140.	330.	.002
75TH	291.	270.	182.	1800.	280.	230.	990.	.004
90TH			188.	3700.	390.	250.	1000.	.006
SECONDARY CODE				02L	12L			

* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q

```
REQUEST 0007 -  0009 PAGE   3                       NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                       SURFACE WATER DATA
STATION 00AL05EB2301    LAT. 53D 36M 33S  LONG. 113D 20M 36S   PR 3   UTM 12 344950E 5942350N  FOR MAY 18, 1982 TO NOV 02, 1982
 NORTH SASKATCHEWAN RIVER     LEFT BANK      DOWNSTREAM OF CLOVERBAR POWER PLANT
 NEAR POWER TRANSMISSION LINES

                            30009L       26304L       13306L       25003L       28009L       42009L       27009L       33005L
                             ZINC         IRON       ALUMINUM     MANGANESE     NICKEL     MOLYBDENUM     COBALT       ARSENIC
                            TOTAL       EXTRBLE.     EXTRBLE.      TOTAL        TOTAL        TOTAL        TOTAL       TOTAL

                 SUBM        ZN           FE           AL           MN           NI           MO           CO           AS
                  ID        MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)              12(1)        12(1)        8(0)         9(1)         12(1)        8(8)         12(11)       7(2)
           LOW               L.001        L.02         .203         .009         L.001        L.001        L.001       L.0002
          HIGH               .050         1.21         2.860        .110         .010         L.001        .002        .0007
       AVERAGE               .034*        .35*         .893         .031*        .005*                     .001*       .0004*
      STD.DEV.               .014*        .33*         .935         .032*        .002*                     .000*       .0002*
   PERCNT:10TH               .015         .11                                    .003                      L.001
          25TH               .030         .12          .399         .012         .005         L.001        L.001       L.0002
   MEDIAN 50TH               .036         .23          .457         .016         .005         L.001        L.001       .0004
          75TH               .042         .45          1.185        .042         .006         L.001        L.001       .0005
          90TH               .048         .63                                    .007                      L.001
SECONDARY CODE

                            04304L       48009L       24009L       82302L       82009L       80015L       34005L       23009L
                           BERYLLIUM     CADMIUM      CHROMIUM      LEAD         LEAD        MERCURY     SELENIUM     VANADIUM
                           EXTRBLE.      TOTAL        TOTAL       EXTRBLE.      TOTAL        TOTAL       TOTAL        TOTAL

                 SUBM        BE           CD           CR           PB           PB           HG           SE           V
                  ID        MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)              8(8)         12(10)       12(2)                     12(7)                     7(5)         8(4)
           LOW              L.001        L.001        L.001                     L.003                     L.0002       L.002
          HIGH              L.001        .004         .013                      .016                      .0007        .010
       AVERAGE                           .001*        .005*                     .005*                     .0003*       .003*
      STD.DEV.                           .001*        .003*                     .004*                     .0002*       .003*
   PERCNT:10TH                           L.001        L.001                     L.003
          25TH              L.001        L.001        .004                      L.003                     L.0002       L.002
   MEDIAN 50TH              L.001        L.001        .005                      L.003                     L.0002       .002*
          75TH              L.001        L.001        .007                      .005                      .0003        .004
          90TH                           .002         .009                      .007
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE   4                     NAQUADAT SUMMARY REPORT  APR 30, 1936
                                                     SURFACE WATER DATA
STATION 00AL05EB2302    LAT. 53D 36M 30S  LONG. 113D 20M 39S   PR 3   UTM 12 344900E 5942300N  FOR MAY 18, 1982 TO NOV 02, 1982
 NORTH SASKATCHEWAN RIVER       CENTRE     DOWNSTREAM OF CLOVERBAR POWER PLANT
 NEAR POWER TRANSMISSION LINES

                       97251F        02065F        08102F        02042F        02041L        10301L        08202L        08301L
                      DEPTH OF     TEMPERATURE     OXYGEN       SPECIFIC      SPECIFIC        PH            OXYGEN       OXYGEN
                      SAMPLING       WATER       DISSOLVED      CONDUCT.      CONDUCT.                     BIOCHEM.     TOTAL COD
                                                                                                         DEMAND-BOD
               SUBM  FROM SURF.                      02                                                      02            02
                ID       M           DEG.C          MG/L        USIE/CM         US/CM     PH UNITS        MG/L          MG/L
SAMPLES(FLAGS)           12(0)         12(0)         12(0)         11(0)         12(0)         12(0)         12(2)         12(0)
           LOW              .9            1.           7.7          300.          267.           8.0           L.3           6.1
          HIGH             2.1          20.5          14.7          410.          352.           8.4           2.9           44.
       AVERAGE             1.5          14.4          10.0          358.          323.                         1.3*         16.7
      STD.DEV.              .5           6.3           2.1           38.           25.                         1.0*         10.1
   PERCNT:10TH              .9            5.           8.3          320.          297.           8.1           L.3           8.9
          25TH             1.0          11.3           8.4          320.          309.           8.1            .4          11.0
   MEDIAN 50TH             1.5          16.3           9.2          350.          328.           8.2           1.1          13.5
          75TH             1.9          19.0          11.5          390.          341.           8.3           2.2          19.5
          90TH             2.1           19.          12.7          400.          348.           8.4           2.7           26.
SECONDARY CODE

                       06536L        06005L        06154L        06107L        06905L        06715L        06721L        10151L
                       PHENOLIC      CARBON        CARBON        CARBON        CARBON      CHLORO -     CHLOROPHYLL   ALKALINITY
                       MATERIAL       TOTAL       DISSOLVED     DISSOLVED    PARTICULATE    PHYLL A         -A-          PHENOL
                       PHENOL       ORGANIC       INORGANIC      ORGANIC       TOTAL                     EPILITHON    PHTHALEIN
               SUBM                     C             C            C             C                                    CACO3
                ID      MG/L          MG/L          MG/L          MG/L          MG/L          MG/M3       MG/M2         MG/L
SAMPLES(FLAGS)           12(6)         11(0)                                                                           12(3)
           LOW           L.002           5.7                                                                              .0
          HIGH            .004          12.4                                                                            L4.2
       AVERAGE            .002*          8.4                                                                             1.0*
      STD.DEV.            .001*          2.3                                                                             1.9*
   PERCNT:10TH           L.002           5.8                                                                              .0
          25TH           L.002            6.                                                                              .0
   MEDIAN 50TH            .002*           8.                                                                              .0
          75TH            .002           11.                                                                             2.1*
          90TH            .003           11.                                                                            L4.2
SECONDARY CODE

                       10101L        06301L        06201L        17203L        16306L        09107L        14102L        10602L
                     ALKALINITY     CARBONATE    BICARBONT.     CHLORIDE       SULPHATE     FLUORIDE        SILICA      HARDNESS
                        TOTAL       (CALCD.)       (CALCD.)     DISSOLVED     DISSOLVED     DISSOLVED     REACTIVE        TOTAL
                                                                                                                        (CALCD.)
               SUBM     CACO3         CO3           HCO3          CL            SO4           F             SIO2         CACO3
                ID      MG/L          MG/L       MG/L             MG/L          MG/L          MG/L          MG/L         MG/L
SAMPLES(FLAGS)           12(0)         12(3)         12(3)         12(9)         12(0)         12(0)         12(0)         12(0)
           LOW            114.            0.          139.           L0.           20.           .12           3.2          115.
          HIGH            148.           Q5.          180.            3.           40.           .15           5.6          171.
       AVERAGE            133.            1.*        160.*          1.3*          32.           .14           4.2          147.
      STD.DEV.             11.            2.*         14.*           .7*           7.           .01            .6           15.
   PERCNT:10TH            117.            0.          143.           L0.           20.           .13           3.5          136.
          25TH            128.            0.          152.          L1.0           28.           .13           3.8          137.
   MEDIAN 50TH            133.            0.          157.          L1.0           32.           .13           4.1          146.
          75TH            142.            3.          172.           1.5*          40.           .15           4.5          158.
          90TH            146.           Q5.          178.            2.           40.           .15           5.0          160.
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE   5                    NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                      SURFACE WATER DATA
STATION 00AL05EB2302    LAT. 53D 36M 30S  LONG. 113D 20M 39S   PR 3   UTM 12 344900E 5942300N  FOR MAY 18, 1982 TO NOV 02, 1982
 NORTH SASKATCHEWAN RIVER        CENTRE     DOWNSTREAM OF CLOVERBAR POWER PLANT
  NEAR POWER TRANSMISSION LINES

                         20110L       12102L       11103L       19103L       15406L       15419L       07403L       07602L
                         CALCIUM      MAGNESIUM    SODIUM       POTASSIUM    PHOSPHOROUS  PHOSPHORUS   NITROGEN     NITROGEN
                         DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED    TOTAL        TOTAL        TOTAL ORG.   TOTAL
                                                                             PHOSPHATE    PHOSPHATE    (CALCD.)     (CALCD.)
                  SUBM   CA           MG           NA           K            P            P            N            N
                  ID     MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)           12(0)        12(0)        12(0)        12(0)        8(0)         5(0)         12(12)       12(12)
           LOW           33.          8.           2.           .6           .027         .039         Q.100        Q.550
          HIGH           47.          14.          7.           8.0          .155         .106         Q.200        Q.650
       AVERAGE           41.          10.8         5.1          1.5          .066         .065
      STD.DEV.           4.           1.6          1.5          2.0          .040         .026
  PERCNT:10TH            38.          10.          4.           .8                                    Q.100        Q.550
          25TH           39.          10.0         4.0          .9           .039         .046         .100         .550
   MEDIAN 50TH           41.          10.5         5.5          1.0          .057         .064         .100         .550
          75TH           43.          11.5         6.0          1.0          .076         .072         .100         .610
          90TH           46.          13.          7.           1.2                                    Q.200        Q.650
SECONDARY CODE                                                                            21L

                         07021L       07503L       07562L       07205L       07206L       07105L       07906L       10407L
                         NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN     RESIDUE
                         TOTAL        TOTAL        DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED    PARTICULATE  NONFILTRABLE
                         KJELDAHL     AMMONIA      AMMONIA      NITRITE      NITRITE      NO3 & NO2    TOTAL
                  SUBM   N            N            N            N            N            N            N
                  ID     MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)           12(5)        12(12)       5(0)         12(12)       12(8)        12(9)                     5(0)
           LOW           .280         L.4          .066         L.05         L.007        L.05                      6.
          HIGH           .6           L.4          .360         L.05         .010         .12                       17.
       AVERAGE           .443*                     .156                      .007*        .062*                     12.
      STD.DEV.           .103*                     .117                      .001*        .024*                     4.
  PERCNT:10TH            .290         L.4                       L.05         L.007        L.05
          25TH           .350         L.40         .101         L.050        L.007        L.050                     11.
   MEDIAN 50TH           L.500        L.40         .112         L.050        L.007        L.050                     12.
          75TH           L.500        L.40         .143         L.050        .008         .065*                     12.
          90TH           .5           L.4                       L.05         .009         .10
SECONDARY CODE           01L

                         10474L       10453L       00205L       36001L       36011L       36102L       36910L       29009L
                         RESIDUE      RESIDUE      TOTAL        COLIFORMS    COLIFORMS    STREP.       STD. PLATE   COPPER
                         TOTAL        FILTRABLE    DISSOLVED    TOTAL        FECAL        FECAL        COUNT        TOTAL
                                                   SOLIDS                                              BACT.DENS.
                  SUBM                                          MPN          MPN          MF                        CU
                  ID     MG/L         MG/L         MG/L         NO/100ML     NO/100ML     NO/100ML     NO/ML        MG/L
SAMPLES(FLAGS)           5(0)         5(0)         12(0)        12(0)        12(0)        12(0)        10(0)        12(3)
           LOW           212.         200.         134.         1400.        140.         70.          200.         L.001
          HIGH           316.         310.         191.         30000.       1200.        400.         8800.        .007
       AVERAGE           270.         258.         171.         6917.        549.         208.         2398.        .003*
      STD.DEV.           50.          51.          15.          7886.        349.         97.          2920.        .002*
  PERCNT:10TH                                      157.         1400.        210.         110.         210.         L.001
          25TH           221.         210.         166.         2800.        265.         145.         270.         .001*
   MEDIAN 50TH           287.         270.         172.         4100.        475.         175.         1200.        .002
          75TH           312.         300.         182.         8450.        840.         285.         4500.        .004
          90TH                                     186.         11000.       1000.        330.         7200.        .005
SECONDARY CODE                                                  02L          12L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE   6                    NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                      SURFACE WATER DATA
STATION 00AL05EB2302    LAT. 53D 36M 30S  LONG. 113D 20M 39S   PR 3   UTM 12 344900E 5942300N  FOR MAY 18, 1982 TO NOV 02, 1982
 NORTH SASKATCHEWAN RIVER        CENTRE      DOWNSTREAM OF CLOVERBAR POWER PLANT
 NEAR POWER TRANSMISSION LINES

                           30009L       26304L       13306L       25003L       28009L       42009L       27009L       33005L
                            ZINC         IRON       ALUMINUM     MANGANESE     NICKEL     MOLYBDENUM     COBALT       ARSENIC
                           TOTAL       EXTRBLE.     EXTRBLE.      TOTAL        TOTAL        TOTAL        TOTAL       TOTAL

                    SUBM    ZN           FE           AL           MN           NI           MO           CO           AS
                     ID    MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)             12(0)        12(0)        8(0)         9(0)         12(1)         7(6)        12(12)        7(2)
           LOW              .012          .03         .179         .009         L.001        L.001        L.001       L.0002
          HIGH              .062         1.26        4.290         .120          .010         .009        L.001        .0007
       AVERAGE              .030          .38         .921         .031          .006*        .002*                    .0004*
      STD.DEV.              .014          .40        1.403         .037          .002*        .003*                    .0002*
   PERCNT:10TH              .012          .06                                    .004                     L.001
          25TH              .021          .14         .262         .011          .004        L.001        L.001       L.0002
   MEDIAN 50TH              .028          .24         .354         .013          .005        L.001        L.001        .0004
          75TH              .036          .51         .833         .036          .007        L.001        L.001        .0005
          90TH              .046         1.03                                    .009                     L.001
SECONDARY CODE

                           04304L       48009L       24009L       82302L       82009L       80015L       34005L       23009L
                          BERYLLIUM     CADMIUM     CHROMIUM       LEAD         LEAD       MERCURY      SELENIUM     VANADIUM
                           EXTRBLE.      TOTAL        TOTAL      EXTRBLE.       TOTAL        TOTAL       TOTAL        TOTAL

                    SUBM    BE           CD           CR           PB           PB           HG           SE           V
                     ID    MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)             8(8)         12(12)       12(0)                      12(6)                      7(7)         7(5)
           LOW             L.001        L.001         .004                      L.003                     L.0002       L.002
          HIGH             L.001        L.001         .012                       .024                     L.0002        .012
       AVERAGE                                        .007                       .006*                                  .004*
      STD.DEV.                                        .002                       .006*                                  .004*
   PERCNT:10TH                          L.001         .004                      L.003
          25TH             L.001        L.001         .005                      L.003                     L.0002       L.002
   MEDIAN 50TH             L.001        L.001         .006                       .003*                    L.0002       L.002
          75TH             L.001        L.001         .008                       .007                     L.0002        .003
          90TH                          L.001         .009                       .008
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE   7                     NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                      SURFACE WATER DATA
STATION 00AL05EB2303    LAT. 53D 36M 27S  LONG. 113D 20M 42S   PR 3   UTM 12 344850E 5942200N  FOR MAY 18, 1982 TO NOV 02, 1982
 NORTH SASKATCHEWAN RIVER   RIGHT BANK      DOWNSTREAM OF CLOVERBAR POWER PLANT
 NEAR POWER TRANSMISSION LINES

                         97251F       02065F       08102F       02042F       02041L       10301L       08202L       08301L
                        DEPTH OF    TEMPERATURE    OXYGEN      SPECIFIC     SPECIFIC        PH         OXYGEN       OXYGEN
                        SAMPLING       WATER      DISSOLVED    CONDUCT.     CONDUCT.                   BIOCHEM.    TOTAL COD
                                                                                                     DEMAND-BOD
                   SUBM FROM SURF.                   02                                                  02           02
                    ID      M          DEG.C        MG/L       USIE/CM        US/CM      PH UNITS       MG/L         MG/L
SAMPLES(FLAGS)            12(0)        12(0)        12(0)        11(0)        12(0)        12(0)        12(0)        12(0)
           LOW               .6           2.          7.3         310.         277.          7.9           .6          6.4
          HIGH              1.8         21.5          15.         430.         372.          8.3          9.2          29.
       AVERAGE               .9         15.8         10.0         379.         341.                       3.4         17.3
      STD.DEV.               .4          6.4          2.2          36.          29.                       3.2          7.0
  PERCNT:10TH                .6          6.5          8.3         335.         305.          7.9           .6          10.
          25TH               .6         12.7          8.3         355.         323.          8.0          1.2         12.0
   MEDIAN 50TH               .9         18.3          9.2         380.         351.          8.1          2.1         17.0
          75TH              1.0         20.3         11.5         410.         364.          8.2          5.8         22.5
          90TH              1.2         21.5         12.4         410.         366.          8.3          8.2          27.
SECONDARY CODE

                         06536L       06005L       06154L       06107L       06905L       06715L       06721L       10151L
                        PHENOLIC      CARBON       CARBON       CARBON       CARBON     CHLORO -    CHLOROPHYLL   ALKALINITY
                        MATERIAL      TOTAL      DISSOLVED    DISSOLVED   PARTICULATE   PHYLL A        -A-         PHENOL
                         PHENOL      ORGANIC     INORGANIC     ORGANIC       TOTAL                   EPILITHON    PHTHALEIN
                   SUBM                 C            C            C            C                                 CACO3
                    ID    MG/L         MG/L         MG/L         MG/L         MG/L         MG/M3        MG/M2        MG/L
SAMPLES(FLAGS)            12(6)        11(0)                                                                      11(0)
           LOW            L.002           5.                                                                         .0
          HIGH             .005         14.5                                                                         0.
       AVERAGE             .003*        10.2                                                                         .0
      STD.DEV.             .001*         2.8                                                                         .0
  PERCNT:10TH             L.002          7.5                                                                         .0
          25TH            L.002          7.9                                                                         .0
   MEDIAN 50TH             .002*        10.3                                                                         0.
          75TH             .003         12.6                                                                         0.
          90TH             .004         13.1                                                                         0.
SECONDARY CODE

                         10101L       06301L       06201L       17203L       16306L       09107L       14102L       10602L
                       ALKALINITY   CARBONATE    BICARBONT.    CHLORIDE     SULPHATE     FLUORIDE      SILICA      HARDNESS
                          TOTAL      (CALCD.)      (CALCD.)    DISSOLVED    DISSOLVED    DISSOLVED    REACTIVE       TOTAL
                                                                                                                  (CALCD.)
                   SUBM   CACO3         CO3         HCO3          CL           SO4           F          SIO2         CACO3
                    ID    MG/L         MG/L        MG/L          MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)            12(0)        11(0)        11(0)        12(3)        12(0)        12(0)        12(0)        12(0)
           LOW             115.           0.         140.          L0.          25.          .13          3.2         127.
          HIGH             149.           0.         180.           8.          40.          .20          5.6         171.
       AVERAGE             135.           0.         163.          2.7*         34.          .16          4.3         150.
      STD.DEV.              12.           0.          14.          1.9*          5.          .02           .7          13.
  PERCNT:10TH              117.           0.         143.          L0.          25.          .14          3.5         136.
          25TH             128.           0.         155.          1.5*         30.          .15          3.9         141.
   MEDIAN 50TH             137.           0.         166.          2.0          35.          .16          4.2         145.
          75TH             146.           0.         177.          3.0          38.          .17          4.6         162.
          90TH             148.           0.         179.           4.          40.          .18          5.1         164.
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE   8                     NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                      SURFACE WATER DATA
STATION 00AL05EB2303    LAT. 53D 36M 27S  LONG. 113D 20M 42S   PR 3   UTM 12 344850E 5942200N  FOR MAY 18, 1982 TO NOV 02, 1982
 NORTH SASKATCHEWAN RIVER   RIGHT BANK     DOWNSTREAM OF CLOVERBAR POWER PLANT
 NEAR POWER TRANSMISSION LINES
                      20110L        12102L        11103L        19103L        15406L        15419L        07403L        07602L
                     CALCIUM      MAGNESIUM       SODIUM      POTASSIUM     PHOSPHOROUS   PHOSPHORUS     NITROGEN      NITROGEN
                    DISSOLVED     DISSOLVED     DISSOLVED     DISSOLVED        TOTAL         TOTAL      TOTAL ORG.       TOTAL
                                                                           PHOSPHATE     PHOSPHATE     (CALCD.)      (CALCD.)
              SUBM      CA            MG            NA            K             P             P             N             N
                ID     MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
    SAMPLES(FLAGS)       12(0)         12(0)         12(0)         12(0)          9(0)          5(0)        12(12)         12(5)
               LOW         36.            9.            3.            .7           .07          .114         Q.100         Q.600
              HIGH         47.           14.           13.           1.5          .195          .180         Q.300          .900
           AVERAGE         42.          11.3           7.9           1.1          .144          .154                        .693*
          STD.DEV.          3.           1.4           2.7            .2          .039          .027                        .095*
       PERCNT:10TH         38.           10.            6.           1.0                                     Q.100          .620
              25TH         40.          10.0           6.0           1.0          .124          .142          .100          .620
       MEDIAN 50TH         41.          11.0           8.0           1.0          .141          .160          .150          .660
              75TH         45.          12.0           8.5           1.3          .164          .173          .200          .745
              90TH         46.           13.           12.           1.3                                     Q.300          .830
    SECONDARY CODE                                                                             21L

                      07021L        07503L        07562L        07205L        07206L        07105L        07906L        10407L
                     NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN      RESIDUE
                       TOTAL         TOTAL      DISSOLVED     DISSOLVED     DISSOLVED     DISSOLVED    PARTICULATE  NONFILTRABLE
                     KJELDAHL      AMMONIA       AMMONIA       NITRITE       NITRITE      NO3 & NO2       TOTAL
              SUBM      N             N             N             N             N             N             N
                ID     MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
    SAMPLES(FLAGS)       12(1)        12(12)          5(0)        12(11)         12(2)         12(1)                      5(0)
               LOW         L.5           L.4          .218          L.05         L.007          L.05                       12.
              HIGH          .7           L.4          .450           .07          .035           .23                       20.
           AVERAGE        .605*                       .371          .052*         .018*         .126*                      16.
          STD.DEV.        .066*                       .094          .006*         .009*         .052*                       3.
       PERCNT:10TH          .5           L.4                        L.05         L.007           .07
              25TH        .575          L.40          .345         L.050          .010          .090                       15.
       MEDIAN 50TH        .600          L.40          .410         L.050          .016          .120                       16.
              75TH        .665          L.40          .433         L.050          .021          .145                       18.
              90TH        .680           L.4                        L.05          .034           .20
    SECONDARY CODE         01L

                      10474L        10453L        00205L        36001L        36011L        36102L        36910L        29009L
                      RESIDUE       RESIDUE        TOTAL      COLIFORMS     COLIFORMS       STREP.     STD. PLATE      COPPER
                       TOTAL       FILTRABLE     DISSOLVED       TOTAL         FECAL         FECAL        COUNT         TOTAL
                                                  SOLIDS                                              BACT.DENS.
              SUBM                                               MPN           MPN           MF                         CU
                ID     MG/L          MG/L          MG/L       NO/100ML      NO/100ML      NO/100ML       NO/ML         MG/L
    SAMPLES(FLAGS)        5(0)          5(0)         12(0)         12(0)         12(0)         12(0)         11(0)         12(3)
               LOW        205.          190.          150.         2500.           72.           70.          260.         L.001
              HIGH        312.          300.          201.        22000.         4700.          490.        15000.          .007
           AVERAGE        270.          254.          180.         9650.         1222.          265.         3811.          .003*
          STD.DEV.         47.           47.           15.         6285.         1210.          131.         4626.          .002*
       PERCNT:10TH                                    163.         4200.          170.          120.          460.         L.001
              25TH        236.          220.          170.         5400.          525.          190.          600.          .001*
       MEDIAN 50TH        298.          280.          180.         7300.         1000.          205.         1600.          .002
              75TH        300.          280.          195.        12000.         1400.          385.         6800.          .004
              90TH                                    196.        21000.         1700.          420.         8800.          .006
    SECONDARY CODE                                                  02L           12L
 * THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE   9                        NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                          SURFACE WATER DATA
STATION 00AL05EB2303    LAT. 53D 36M 27S  LONG. 113D 20M 42S   PR 3   UTM 12 344850E 5942200N  FOR MAY 18, 1982 TO NOV 02, 1982
 NORTH SASKATCHEWAN RIVER   RIGHT BANK      DOWNSTREAM OF CLOVERBAR POWER PLANT
 NEAR POWER TRANSMISSION LINES

                         30009L      26304L      13306L      25003L      28009L      42009L      27009L      33005L
                          ZINC        IRON      ALUMINUM   MANGANESE     NICKEL    MOLYEDENUM    COBALT     ARSENIC
                         TOTAL      EXTRBLE.    EXTRBLE.     TOTAL       TOTAL       TOTAL       TOTAL      TOTAL

                 SUBM     ZN          FE          AL          MN          NI          MO          CO          AS
                  ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           12(0)       12(0)        8(0)        8(0)       12(0)        7(7)       12(11)       7(2)
           LOW            .002         .05        .152        .013        .003       L.001       L.001      L.0002
          HIGH            .058         .95       3.940        .113        .016       L.001        .003       .0009
       AVERAGE            .033         .36        .942        .035        .007                    .001*      .0004*
      STD.DEV.            .017         .32       1.327        .034        .003                    .001*      .0003*
  PERCNT:10TH             .014         .12                                .004                   L.001
          25TH            .020         .19        .290        .015        .006       L.001       L.001      L.0002
   MEDIAN 50TH            .037         .22        .321        .018        .006       L.001       L.001       .0004
          75TH            .044         .55       1.110        .044        .007       L.001       L.001       .0006
          90TH            .052         .90                                .010                   L.001
SECONDARY CODE

                         04304L      48009L      24009L      82302L      82009L      80015L      34005L      23009L
                       BERYLLIUM    CADMIUM     CHROMIUM      LEAD        LEAD       MERCURY    SELENIUM    VANADIUM
                        EXTRBLE.     TOTAL       TOTAL      EXTRBLE.     TOTAL       TOTAL      TOTAL        TOTAL

                 SUBM     BE          CD          CR          PB          PB          HG          SE          V
                  ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            8(8)       12(11)      11(1)                   12(6)                    6(4)        7(3)
           LOW           L.001       L.001       L.001                   L.003                  L.0002       L.002
          HIGH           L.001        .005        .013                    .008                   .0003        .013
       AVERAGE                        .001*       .007*                   .005*                  .0002*       .004*
      STD.DEV.                        .001*       .003*                   .002*                  .0001*       .004*
  PERCNT:10TH                        L.001        .005                   L.003
          25TH           L.001       L.001        .005                   L.003                  L.0002       L.002
   MEDIAN 50TH           L.001       L.001        .006                    .003*                 L.0002        .003
          75TH           L.001       L.001        .009                    .006                   .0003        .004
          90TH                       L.001        .011                    .008
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  10                      NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                          SURFACE WATER DATA
STATION 00AL05EB2371    LAT. 53D 42M 53S  LONG. 113D 14M 27S   PR 3   UTM 12 352150E 5953900N  FOR MAY 18, 1982 TO FEB 29, 1984
 NORTH SASKATCHEWAN RIVER     LEFT BANK      ABOVE FORT SASK. RAILWAY TRESTLE
 90M UPSTREAM

                          97251F      02065F      08102F      02042F      02041L      10301L      08202L      08301L
                         DEPTH OF   TEMPERATURE   OXYGEN     SPECIFIC    SPECIFIC       PH        OXYGEN      OXYGEN
                         SAMPLING      WATER     DISSOLVED   CONDUCT.    CONDUCT.                BIOCHEM.    TOTAL COD
                                                                                               DEMAND-BOD
                  SUBM  FROM SURF.                  O2                                              O2          O2
                   ID       M         DEG.C        MG/L       USIE/CM      US/CM     PH UNITS      MG/L        MG/L
SAMPLES(FLAGS)            17(0)       21(0)       21(0)       20(0)       22(0)       22(0)       19(3)       21(3)
           LOW               .1          .4         7.2        235.        275.         7.7          .4        L5.0
          HIGH              2.1        24.0        14.0        430.        376.         8.6          3.        29.7
       AVERAGE              1.0        14.2        10.1        359.        332.                     1.5*       12.8*
      STD.DEV.               .5         7.4         2.1         45.         25.                      .8*        7.1*
  PERCNT:10TH                .3         1.0         8.1        310.        310.         7.9          .5        L5.0
          25TH               .6         9.0         8.7        340.        319.         8.0        L1.0         7.3
    MEDIAN 50TH              .9         17.         9.2        365.        334.         8.1         1.3         11.
          75TH              1.2        19.5        12.0        385.        347.         8.4         2.3         17.
          90TH              1.8         21.        13.4        415.        364.         8.5         2.7        24.8
SECONDARY CODE                                                                                                04L

                          06536L      06005L      06154L      06107L      06905L      06715L      06721L      10151L
                         PHENOLIC     CARBON      CARBON      CARBON      CARBON     CHLORO -   CHLOROPHYLL  ALKALINITY
                         MATERIAL     TOTAL     DISSOLVED   DISSOLVED  PARTICULATE   PHYLL A        -A-        PHENOL
                          PHENOL     ORGANIC    INORGANIC    ORGANIC      TOTAL                  EPILITHON   PHTHALEIN
                  SUBM                  C           C           C           C                                 CACO3
                   ID      MG/L       MG/L        MG/L        MG/L        MG/L        MG/M3       MG/M2        MG/L
SAMPLES(FLAGS)            22(15)      11(0)       14(0)       14(0)       14(0)        9(0)        9(0)       20(6)
           LOW             L.001        6.8        31.0          .6         .03        1.43      18.513          .0
          HIGH              .004        10.        35.6        45.0        5.02        9.66      270.11         4.2
       AVERAGE              .002*       8.5        32.7         5.5        1.71        3.87      95.776         1.5*
      STD.DEV.              .001*       1.2         1.8        11.5        1.28        2.36     100.415         2.1*
  PERCNT:10TH              L.002        7.2        31.0          .9         .37                                  .0
          25TH             L.002        7.6        31.0         1.2        1.10        2.75      23.960          .0
    MEDIAN 50TH            L.002        8.2        32.0         1.5        1.33        2.93      42.931          .0
          75TH              .002        10.        34.0         4.1        2.10        4.24      200.40        L4.2
          90TH              .003        10.        35.0         6.7        3.27                                L4.2
SECONDARY CODE            37L

                          10101L      06301L      06201L      17203L      16306L      09107L      14102L      10602L
                        ALKALINITY  CARBONATE   BICARBONT.   CHLORIDE    SULPHATE    FLUORIDE     SILICA     HARDNESS
                          TOTAL      (CALCD.)     (CALCD.)   DISSOLVED   DISSOLVED   DISSOLVED   REACTIVE      TOTAL
                                                                                                            (CALCD.)
                  SUBM     CACO3       CO3        HCO3          CL          SO4          F          SIO2        CACO3
                   ID      MG/L       MG/L       MG/L          MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            22(0)       20(6)       20(6)       21(10)      22(0)       22(0)       22(0)       22(0)
           LOW              116.         0.       Q132.         L0.         20.         .12         2.1        116.
          HIGH              150.         5.        174.         6.0         52.         .16         5.4        167.
       AVERAGE              132.         2.*       158.*        2.0*        37.         .14         3.8        149.
      STD.DEV.               8.          2.*        11.*        1.5*         8.         .01          .9         12.
  PERCNT:10TH               125.         0.        142.         L0.         27.         .12         3.0        135.
          25TH              128.         0.        149.         L0.         30.         .13         3.4        141.
    MEDIAN 50TH             132.         0.        162.          2.         40.         .14         3.7        153.
          75TH              137.         5.        167.          2.         42.         .15         4.2        154.
          90TH              143.         5.        170.          3.         45.         .15         5.2        159.
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  11                      NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                         SURFACE WATER DATA
STATION 00AL05EB2371    LAT. 53D 42M 53S  LONG. 113D 14M 27S   PR 3   UTM 12 352150E 5953900N  FOR MAY 18, 1982 TO FEB 29, 1984
 NORTH SASKATCHEWAN RIVER     LEFT BANK      ABOVE FORT SASK. RAILWAY TRESTLE
 90M UPSTREAM

                         20110L        12102L        11103L        19103L        15406L        15419L        07403L        07602L
                        CALCIUM      MAGNESIUM      SODIUM      POTASSIUM   PHOSPHOROUS    PHOSPHORUS     NITROGEN      NITROGEN
                       DISSOLVED     DISSOLVED     DISSOLVED     DISSOLVED       TOTAL         TOTAL      TOTAL ORG.      TOTAL
                                                                              PHOSPHATE     PHOSPHATE     (CALCD.)      (CALCD.)
                SUBM       CA            MG            NA             K             P             P             N             N
                 ID       MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)           22(0)         22(0)         22(0)         22(0)          8(0)         11(0)        11(11)        22(15)
           LOW             35.            7.            3.            .6          .011          .054         Q.100          .310
          HIGH             47.          13.0            9.           1.6          .162          .180         Q.300          .920
       AVERAGE             41.          11.2           6.0           1.0          .071          .092                       .569*
      STD.DEV.              3.           1.3           1.7            .3          .046          .039                       .144*
  PERCNT:10TH              37.           10.            4.            .8                        .058         Q.100         Q.390
          25TH             40.           11.            5.            .8          .043          .059         Q.100         Q.530
   MEDIAN 50TH             41.          11.5           6.0            .9          .066          .090         Q.100          .550
          75TH             42.           12.           7.0           1.1          .089          .126         Q.100         Q.600
          90TH             45.          12.0           8.0           1.5                        .130         Q.200          .760
SECONDARY CODE                                                                                   21L

                         07021L        07503L        07562L        07205L        07206L        07105L        07906L        10407L
                        NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN      RESIDUE
                         TOTAL         TOTAL       DISSOLVED     DISSOLVED     DISSOLVED     DISSOLVED   PARTICULATE  NONFILTRABLE
                        KJELDAHL      AMMONIA       AMMONIA       NITRITE       NITRITE      NO3 & NO2      TOTAL
                SUBM       N             N             N             N             N             N             N
                 ID       MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)           22(9)        11(11)         11(0)        22(20)         11(7)        22(13)         14(3)         15(0)
           LOW            .240           L.4          .051          L.05         L.007          L.05          L.01            2.
          HIGH            .720           L.4          .540           .08          .025           .20          2.34          101.
       AVERAGE            .496*                       .207          .052*         .010*         .072*         .285*          24.
      STD.DEV.            .120*                       .162          .008*         .006*         .041*         .614*          25.
  PERCNT:10TH             .340           L.4          .062          L.05         L.007          L.05          L.01            7.
          25TH            .460           L.4          .070          L.05         L.007          L.05           .05            9.
   MEDIAN 50TH           L.500           L.4          .124         L.050         L.007         L.050          .085           15.
          75TH            .500           L.4          .310          L.05          .015          .070           .17           36.
          90TH              .7           L.4          .380         L.050          .015          .100           .66           40.
SECONDARY CODE           01L

                         10474L        10453L        00205L        36001L        36011L        36102L        36910L        29009L
                        RESIDUE       RESIDUE        TOTAL       COLIFORMS     COLIFORMS      STREP.      STD. PLATE      COPPER
                         TOTAL       FILTRABLE     DISSOLVED       TOTAL         FECAL         FECAL         COUNT         TOTAL
                                                    SOLIDS                                                BACT.DENS.
                SUBM                                                MPN           MPN            MF                          CU
                 ID       MG/L          MG/L          MG/L       NO/100ML      NO/100ML      NO/100ML         NO/ML         MG/L
SAMPLES(FLAGS)           15(0)         15(0)         22(0)         20(0)         20(0)         20(0)         18(0)         22(5)
           LOW            210.          170.          138.          900.          130.            8.          200.         L.001
          HIGH            321.          290.          201.        35000.        13000.         1300.        20000.          .006
       AVERAGE            269.          245.          178.         8995.         1753.          301.         4741.          .003*
      STD.DEV.             29.           28.           15.         9447.         3114.          365.         5999.          .001*
  PERCNT:10TH             230.          220.          160.         1700.          180.           47.          250.         L.001
          25TH            247.          230.          168.         2500.          285.           70.          870.          .002
   MEDIAN 50TH            269.          250.          178.         4000.          590.          130.         1850.          .003
          75TH            296.          260.          190.        12500.         1525.          420.         6400.          .003
          90TH            300.          270.          196.        24500.         5350.          905.        16000.          .005
SECONDARY CODE                                                     02L           12L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  12                    NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                     SURFACE WATER DATA
STATION 00AL05EB2371    LAT. 53D 42M 53S  LONG. 113D 14M 27S   PR 3   UTM 12 352150E 5953900N  FOR MAY 18, 1982 TO FEB 29, 1984
 NORTH SASKATCHEWAN RIVER     LEFT BANK     ABOVE FORT SASK. RAILWAY TRESTLE
 90M UPSTREAM
                         30009L      26304L      13306L      25003L      28009L      42009L      27009L      33005L
                          ZINC        IRON      ALUMINUM   MANGANESE     NICKEL   MOLYBDENUM    COBALT     ARSENIC
                         TOTAL     EXTRBLE.    EXTRBLE.     TOTAL       TOTAL       TOTAL       TOTAL      TOTAL

                  SUBM     ZN          FE          AL          MN          NI          MO          CO          AS
                   ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           22(1)       22(1)       18(0)       19(3)       22(2)       18(16)      22(21)      14(2)
           LOW           L.001        L.02        .060       L.008       L.001       L.001       L.001      L.0002
          HIGH            .057        1.59       5.080        .092        .008        .006        .003       .0014
       AVERAGE            .020*       .35*        .599        .024*       .004*       .001*       .001*      .0005*
      STD.DEV.            .018*       .40*       1.183        .022*       .002*       .001*       .000*      .0003*
   PERCNT:10TH            .003        .05         .065       L.008        .003       L.001       L.001      L.0002
          25TH            .004        .10         .128        .010        .003       L.001       L.001       .0003
    MEDIAN 50TH           .014        .22         .185        .015        .004       L.001       L.001       .0005
          75TH            .038        .44         .538        .038        .006       L.001       L.001       .0007
          90TH            .042        .56        1.530        .050        .006        .004       L.001       .0008
SECONDARY CODE
                         04304L      48009L      24009L      82302L      82009L      80015L      34005L      23009L
                       BERYLLIUM    CADMIUM     CHROMIUM      LEAD        LEAD       MERCURY    SELENIUM    VANADIUM
                        EXTRBLE.     TOTAL       TOTAL      EXTRBLE.     TOTAL       TOTAL      TOTAL        TOTAL

                  SUBM     BE          CD          CR          PB          PB          HG          SE          V
                   ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           18(18)      22(18)      22(7)        9(4)       11(6)       11(11)      12(12)      18(8)
           LOW           L.001       L.000       L.001       L.003       L.003       L.0001      L.0002      L.002
          HIGH           L.001      60.001        .008        .008        .104       L.0001      L.0002       .013
       AVERAGE                       2.728*       .004*       .004*       .013*                               .004*
      STD.DEV.                      12.792*       .002*       .002*       .030*                               .003*
   PERCNT:10TH           L.001       L.001       L.001                   L.003       L.0001      L.0002      L.002
          25TH           L.001       L.001       L.001       L.003       L.003       L.0001      L.0002      L.002
    MEDIAN 50TH          L.001       L.001        .005        .004       L.003       L.0001      L.0002       .003
          75TH           L.001       L.001        .006        .005        .006       L.0001      L.0002       .004
          90TH           L.001        .002        .006                    .006       L.0001      L.0002       .007
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  13                         NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                         SURFACE WATER DATA
STATION 00AL05EB2372    LAT. 53D 42M 50S  LONG. 113D 14M 23S   PR 3   UTM 12 352200E 5953800N  FOR MAY 18, 1982 TO SEP 21, 1983
 NORTH SASKATCHEWAN RIVER        CENTRE     ABOVE FORT SASK. RAILWAY TRESTLE
 90M UPSTREAM

                          97251F       02065F       08102F       02042F       02041L       10301L       08202L       08301L
                         DEPTH OF    TEMPERATURE    OXYGEN      SPECIFIC     SPECIFIC        PH         OXYGEN       OXYGEN
                         SAMPLING       WATER      DISSOLVED    CONDUCT.     CONDUCT.                  BIOCHEM.    TOTAL COD
                                                                                                     DEMAND-BOD
                   SUBM  FROM SURF.                  02                                                 02           02
                    ID       M          DEG.C       MG/L        USIE/CM       US/CM      PH UNITS      MG/L         MG/L
SAMPLES(FLAGS)            13(0)        18(0)       18(0)        18(0)        18(0)        18(0)        15(1)        18(0)
           LOW               .6          4.5          7.           300.         275.         7.7           .3          5.6
          HIGH              2.4         24.0         13.           450.         378.         8.5          2.7         25.3
       AVERAGE              1.7         16.4          9.6          368.         332.                      1.5*        13.7
      STD.DEV.               .5          5.3          1.7           39.          25.                       .7*         5.9
   PERCNT:10TH              1.2          7.7          7.6          320.         294.         7.8           .6          5.9
          25TH              1.5         14.           8.3          340.         319.         7.9         L1.0          9.4
    MEDIAN 50TH             1.8         18.0          9.1          365.         335.         8.0          1.4         13.3
          75TH              2.1         20.          10.6          390.         347.         8.3          1.9         18.
          90TH              2.4         21.5         12.6          435.         372.         8.5          2.6         25.
SECONDARY CODE                                                                                                     04L

                          06536L       06005L       06154L       06107L       06905L       06715L       06721L       10151L
                         PHENOLIC      CARBON       CARBON       CARBON       CARBON      CHLORO -   CHLOROPHYLL  ALKALINITY
                         MATERIAL      TOTAL      DISSOLVED    DISSOLVED   PARTICULATE    PHYLL A        -A-         PHENOL
                          PHENOL      ORGANIC     INORGANIC     ORGANIC       TOTAL                  EPILITHON    PHTHALEIN
                   SUBM                  C            C            C            C                                 CACO3
                    ID     MG/L        MG/L         MG/L         MG/L         MG/L         MG/M3        MG/M2        MG/L
SAMPLES(FLAGS)            18(12)       10(0)        8(0)         8(0)         8(0)         8(0)                    18(3)
           LOW             L.002         6.          31.0           .8          .12         1.37                      .0
          HIGH              .004        11.6         36.0          6.8         7.52        12.53                    L4.2
       AVERAGE              .002*        9.0         32.6          3.0         1.99         4.37                      .7*
      STD.DEV.              .001*        1.9          1.8          2.2         2.39         3.45                     1.6*
   PERCNT:10TH             L.002         6.4                                                                          .0
          25TH             L.002         7.4         31.0          1.2          .66         2.62                      .0
    MEDIAN 50TH            L.002         9.9         32.0          2.3         1.25         3.54                      .0
          75TH              .002        10.          34.0          4.7         2.24         4.38                      .0
          90TH              .003        11.3                                                                        L4.2
SECONDARY CODE            37L

                          10101L       06301L       06201L       17203L       16306L       09107L       14102L       10602L
                        ALKALINITY   CARBONATE    BICARBONT.    CHLORIDE     SULPHATE     FLUORIDE      SILICA      HARDNESS
                          TOTAL       (CALCD.)     (CALCD.)    DISSOLVED    DISSOLVED    DISSOLVED     REACTIVE       TOTAL
                                                                                                                   (CALCD.)
                   SUBM    CACO3        CO3          HCO3          CL          SO4           F           SIO2         CACO3
                    ID     MG/L        MG/L        MG/L           MG/L        MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)            18(0)        18(3)        18(3)        18(9)        18(0)        18(0)        18(0)        18(0)
           LOW             116.           0.         141.          L0.          25.          .11          2.2         114.
          HIGH             150.          Q5.         183.           3.          45.          .16          5.4         169.
       AVERAGE             132.           1.*        159.*         1.6*         36.          .14          4.0         147.
      STD.DEV.               9.           2.*         12.*          .7*          6.          .01           .9          14.
   PERCNT:10TH             117.           0.         143.          L0.          25.          .11          2.4         124.
          25TH             126.           0.        Q152.          L0.          30.          .13          3.5         139.
    MEDIAN 50TH            133.           0.         160.          1.5*         38.          .14          4.0         149.
          75TH             137.           0.         167.           2.          41.          .14          4.4         154.
          90TH             146.          Q5.         178.           3.          43.          .16          5.2         164.
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  14                    NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                    SURFACE WATER DATA
STATION 00AL05EB2372    LAT. 53D 42M 50S  LONG. 113D 14M 23S   PR 3   UTM 12 352200E 5953800N  FOR MAY 18, 1982 TO SEP 21, 1983
 NORTH SASKATCHEWAN RIVER        CENTRE     ABOVE FORT SASK. RAILWAY TRESTLE
 90M UPSTREAM

                          20110L      12102L      11103L      19103L      15406L      15419L      07403L      07602L
                         CALCIUM    MAGNESIUM     SODIUM    POTASSIUM  PHOSPHOROUS  PHOSPHORUS   NITROGEN    NITROGEN
                        DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED     TOTAL       TOTAL    TOTAL ORG.     TOTAL
                                                                        PHOSPHATE   PHOSPHATE    (CALCD.)    (CALCD.)
                   SUBM      CA          MG          NA          K           P           P           N           N
                    ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            18(0)       18(0)       18(0)       18(0)        8(0)       11(0)       10(10)      18(10)
           LOW              34.          7.          2.          .6        .013        .052       Q.100       Q.310
          HIGH              48.         13.         10.         1.7        .121        .180       Q.300        .960
       AVERAGE              41.         10.9         6.2        1.0        .059        .105                    .602*
      STD.DEV.               4.          1.4         2.0         .3        .039        .049                    .175*
   PERCNT:10TH              35.          9.          3.          .7                    .053        .100        .360
          25TH              39.         10.          5.          .9        .021        .064       Q.100       Q.550
   MEDIAN 50TH              41.         11.0         6.0        1.0        .061        .092        .100        .550
          75TH              42.         12.          7.         1.2        .088        .162       Q.100       Q.650
          90TH              46.         12.          9.         1.5                    .162        .250        .890
SECONDARY CODE                                                                      21L

                          07021L      07503L      07562L      07205L      07206L      07105L      07906L      10407L
                         NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN     RESIDUE
                          TOTAL       TOTAL     DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED  PARTICULATE NONFILTRABLE
                        KJELDAHL     AMMONIA     AMMONIA     NITRITE     NITRITE    NO3 & NO2     TOTAL
                   SUBM      N           N           N           N           N           N           N
                    ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            18(5)       10(9)       11(1)       18(14)      10(7)       18(9)        8(1)       11(0)
           LOW             .260        L.4        L.002       L.05        L.007       L.05        L.001         8.
          HIGH             .680         .4         .510        .13         .039        .30         .60         49.
       AVERAGE             .486*        .40*       .148*       .057*       .013*       .099*       .154*       27.
      STD.DEV.             .132*        .00*       .152*       .020*       .011*       .073*       .198*       15.
   PERCNT:10TH             .260        L.40        .010       L.05        L.007       L.05                      9.
          25TH             .380        L.4         .031       L.05        L.007       L.05         .030         9.
   MEDIAN 50TH            L.500        L.40        .120       L.050       L.007        .060*       .085        32.
          75TH              .6         L.4         .210       L.05         .015        .13         .200        42.
          90TH             .660         .40*       .322        .08         .032        .25                     42.
SECONDARY CODE            01L

                          10474L      10453L      00205L      36001L      36011L      36102L      36910L      29009L
                          RESIDUE     RESIDUE      TOTAL    COLIFORMS   COLIFORMS     STREP.   STD. PLATE    COPPER
                           TOTAL     FILTRABLE   DISSOLVED     TOTAL       FECAL       FECAL      COUNT        TOTAL
                                                  SOLIDS                                        BACT.DENS.
                   SUBM                                        MPN         MPN         MF                      CU
                    ID     MG/L        MG/L        MG/L     NO/100ML    NO/100ML    NO/100ML     NO/ML        MG/L
SAMPLES(FLAGS)            11(0)       11(0)       18(0)       18(0)       18(0)       18(1)       16(0)       18(5)
           LOW             229.        200.        151.       1200.        180.         L2.        340.       L.001
          HIGH             322.        290.        202.      37000.      33000.       1700.      16000.        .024
       AVERAGE             264.        237.        176.       8656.       2838.       268.*      4923.        .004*
      STD.DEV.              33.         28.         15.       9773.       7622.       400.*      4665.        .005*
   PERCNT:10TH             230.        210.        153.       1600.        240.         10.        480.       L.001
          25TH             232.        220.        165.       3100.        350.         90.       1400.       L.001
   MEDIAN 50TH             252.        230.        176.       5500.        765.        130.       3200.        .003
          75TH             292.        250.        184.       8200.       1500.        290.       7850.        .003
          90TH             304.        280.        201.      30000.       5300.        770.      12000.        .004
SECONDARY CODE                                             02L         12L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  15                        NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                        SURFACE WATER DATA
STATION 00AL05EB2372    LAT. 53D 42M 50S  LONG. 113D 14M 23S   FR 3   UTM 12 352200E 5953800N  FOR MAY 18, 1982 TO SEP 21, 1983
 NORTH SASKATCHEWAN RIVER        CENTRE      ABOVE FORT SASK. RAILWAY TRESTLE
 90M UPSTREAM

                             30009L      26304L      13306L      25003L      28009L      42009L      27009L      33005L
                              ZINC        IRON      ALUMINUM   MANGANESE     NICKEL    MOLYBDENUM    COBALT     ARSENIC
                             TOTAL      EXTRBLE.    EXTRBLE.     TOTAL       TOTAL       TOTAL       TOTAL       TOTAL

                     SUBM     ZN          FE          AL          MN          NI          MO          CO          AS
                      ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)               18(1)       18(0)       14(0)       15(1)       18(2)       14(13)      18(18)      10(3)
           LOW               L.001         .03        .050       L.008       L.001       L.001       L.001      L.0002
          HIGH                .055        1.41       3.230        .094        .009        .004       L.001       .0015
       AVERAGE                .020*        .40        .571        .031*       .005*       .001*                  .0006*
      STD.DEV.                .018*        .35        .858        .025*       .002*       .001*                  .0004*
   PERCNT:10TH                .003         .04        .118        .009       L.001       L.001       L.001      L.0002
          25TH                .004         .13        .165        .010        .003       L.001       L.001      L.0002
    MEDIAN 50TH               .013         .40        .255        .022        .004       L.001       L.001       .0005
          75TH                .033         .51        .528        .049        .006       L.001       L.001       .0008
          90TH                .054         .89       1.620        .059        .008       L.001       L.001       .0012
SECONDARY CODE

                             04304L      48009L      24009L      82302L      82009L      80015L      34005L      23009L
                            BERYLLIUM    CADMIUM    CHROMIUM      LEAD        LEAD       MERCURY    SELENIUM    VANADIUM
                             EXTRBLE.     TOTAL       TOTAL      EXTRBLE.     TOTAL       TOTAL       TOTAL       TOTAL

                     SUBM     BE          CD          CR          PB          PB          HG          SE          V
                      ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)               14(14)      18(16)      18(5)       6(4)        10(5)       8(8)        10(7)       14(5)
           LOW               L.001       L.001       L.001       L.003       L.003      L.0001      L.0002       L.002
          HIGH               L.001        .004        .007        .005        .092      L.0001       .0004        .009
       AVERAGE                            .001*       .004*       .004*       .013*                  .0002*       .004*
      STD.DEV.                            .001*       .002*       .001*       .028*                  .0001*       .002*
   PERCNT:10TH               L.001       L.001       L.001                   L.003                  L.0002       L.002
          25TH               L.001       L.001       L.001       L.003       L.003      L.0001      L.0002       L.002
    MEDIAN 50TH              L.001       L.001        .004       L.003        .004*     L.0001      L.0002        .004
          75TH               L.001       L.001        .006        .005        .006      L.0001       .0003        .006
          90TH               L.001        .002        .006                    .050                   .0004        .008
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  16                          NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                          SURFACE WATER DATA
STATION 00AL05EB2373     LAT. 53D 42M 47S  LONG. 113D 14M 20S    PR 3    UTM 12 352250E 5953700N  FOR MAY 18, 1982 TO FEB 29, 1984
 NORTH SASKATCHEWAN RIVER    RIGHT BANK      ABOVE FORT SASK. RAILWAY TRESTLE
 90M UPSTREAM

                         97251F        02065F        08102F        02042F        02041L        10301L        08202L        08301L
                        DEPTH OF     TEMPERATURE     OXYGEN       SPECIFIC      SPECIFIC         PH          OXYGEN        OXYGEN
                        SAMPLING        WATER       DISSOLVED     CONDUCT.      CONDUCT.                    BIOCHEM.     TOTAL COD
                                                                                                          DEMAND-BOD
                 SUBM  FROM SURF.                      02                                                      02            02
                  ID        M           DEG.C         MG/L        USIE/CM        US/CM       PH UNITS        MG/L          MG/L
SAMPLES(FLAGS)          17(0)          20(0)         20(0)        20(0)         21(0)         21(0)          18(3)         21(2)
           LOW             .1             .5            7.          300.          278.          7.6             .6          L5.0
          HIGH            3.4           24.6          12.8          470.          390.          8.5            3.6          37.7
       AVERAGE            1.6           15.0           9.8          374.          346.                         1.8*         13.9*
      STD.DEV.             .9            7.0           1.9           44.           28.                          .9*          8.1*
  PERCNT:10TH              .3            2.9           7.4          323.          314.          7.8             .8           6.1
          25TH            1.2            9.5           8.2          340.          334.          7.9           L1.0           7.9
    MEDIAN 50TH           1.5           17.5           9.3          370.          347.          8.0            1.7           13.
          75TH            2.1           20.0          11.9          397.          361.          8.1            2.2           17.
          90TH             3.           20.8          12.6          438.          385.          8.3            3.4          22.7
SECONDARY CODE                                                                                                           04L

                         06536L        06005L        06154L        06107L        06905L        06715L        06721L        10151L
                        PHENOLIC       CARBON        CARBON        CARBON        CARBON       CHLORO -     CHLOROPHYLL   ALKALINITY
                        MATERIAL       TOTAL       DISSOLVED     DISSOLVED    PARTICULATE     PHYLL A         -A-          PHENOL
                         PHENOL       ORGANIC      INORGANIC      ORGANIC        TOTAL                     EPILITHON     PHTHALEIN
                 SUBM                    C             C             C             C                                       CACO3
                  ID      MG/L          MG/L          MG/L          MG/L          MG/L          MG/M3         MG/M2          MG/L
SAMPLES(FLAGS)          21(14)         10(0)         13(0)         13(0)         13(1)          9(0)          9(0)          19(2)
           LOW           L.002            7.          31.0            .7          L.01          1.53         9.445            .0
          HIGH            .005          10.3          36.0           7.5         13.42         14.39        204.38          L4.2
       AVERAGE            .003*          8.5          33.2           2.9          2.89*         5.04         86.920           .4*
      STD.DEV.            .001*          1.2           1.5           2.2          3.87*         3.66         74.209          1.3*
  PERCNT:10TH            L.002           7.0          32.0            .9           .43                                      .0
          25TH           L.002           7.3          32.0           1.4           .81          3.62         34.137           .0
    MEDIAN 50TH          L.002           9.0          33.0           1.7          1.44          4.28         52.643           .0
          75TH            .002           9.1          34.0           4.0          2.40          4.77        157.06            .0
          90TH            .004          10.1          35.6           6.7          8.60                                     L4.2
SECONDARY CODE           37L

                         10101L        06301L        06201L        17203L        16306L        09107L        14102L        10602L
                       ALKALINITY    CARBONATE     BICARBONT.     CHLORIDE      SULPHATE      FLUORIDE       SILICA       HARDNESS
                         TOTAL        (CALCD.)      (CALCD.)     DISSOLVED     DISSOLVED     DISSOLVED      REACTIVE        TOTAL
                                                                                                                        (CALCD.)
                 SUBM    CACO3          CO3          HCO3            CL           SO4            F           SIO2          CACO3
                  ID      MG/L          MG/L         MG/L           MG/L          MG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)           21(0)         19(2)         19(2)         21(4)         21(0)         21(0)         21(0)         20(0)
           LOW            117.            0.          143.           L0.           20.           .11           2.1          114.
          HIGH            153.           Q5.          187.           6.0           51.           .18           5.8          161.
       AVERAGE            133.            1.*         161.*          2.8*          39.           .15           3.9          149.
      STD.DEV.              8.            2.*          12.*          1.4*           9.           .02           1.0           12.
  PERCNT:10TH             126.            0.          145.           L0.           25.           .13           3.2          134.
          25TH            128.            0.          154.            2.           35.           .14           3.5          142.
    MEDIAN 50TH           133.            0.          160.            3.           40.           .15           3.8          152.
          75TH            138.            0.          168.            4.           44.           .16           4.3          158.
          90TH            142.           Q5.          179.            4.           47.           .16           5.2          160.
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  17                     NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                        SURFACE WATER DATA
STATION 00AL05EB2373    LAT. 53D 42M 47S  LONG. 113D 14M 20S   PR 3   UTM 12 352250E 5953700N  FOR MAY 18, 1982 TO FEB 29, 1984
 NORTH SASKATCHEWAN RIVER   RIGHT BANK     ABOVE FORT SASK. RAILWAY TRESTLE
 90M UPSTREAM

                          20110L      12102L      11103L      19103L      15406L      15419L      07403L      07602L
                          CALCIUM    MAGNESIUM    SODIUM    POTASSIUM  PHOSPHOROUS  PHOSPHORUS   NITROGEN    NITROGEN
                         DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED    TOTAL       TOTAL     TOTAL ORG.    TOTAL
                                                                        PHOSPHATE   PHOSPHATE    (CALCD.)    (CALCD.)
                   SUBM     CA          MG          NA          K           P           P           N           N
                    ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            21(0)       20(0)       21(0)       21(0)        8(0)       11(0)                   21(5)
           LOW              34.          7.          3.          .7        .029        .084                    .410
          HIGH              48.        13.0         11.         2.4        .232        .300                   1.920
       AVERAGE              41.        11.3         7.3         1.2        .125        .175                    .914*
      STD.DEV.               3.         1.5         2.3          .4        .063        .082                    .369*
  PERCNT:10TH               37.        10.0          4.          .9                    .084                   Q.550
          25TH              40.        10.5          6.          .9        .090        .108                    .700
   MEDIAN 50TH              41.        12.0         7.0         1.1        .118        .148                   Q.800
          75TH              43.        12.0          9.         1.2        .163        .280                   1.130
          90TH              44.        13.0         10.         1.9                    .280                   1.280
SECONDARY CODE                                                                         21L

                          07021L      07503L      07562L      07205L      07206L      07105L      07906L      10407L
                         NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN     RESIDUE
                           TOTAL       TOTAL    DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED  PARTICULATE NONFILTRABLE
                         KJELDAHL    AMMONIA     AMMONIA     NITRITE     NITRITE   NO3 & NO2      TOTAL
                   SUBM     N           N           N           N           N           N           N
                    ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            21(4)       10(8)       11(0)       21(13)      10(4)       21(2)       13(4)       14(0)
           LOW             .260         L.4        .056        L.05       L.007        L.05        L.01          8.
          HIGH            1.400         1.4        .860         .25        .084         .52        1.79        134.
       AVERAGE             .699*        .50*       .414        .073*       .025*       .215*       .208*        31.
      STD.DEV.             .279*        .32*       .281        .046*       .028*       .133*       .481*        33.
  PERCNT:10TH               L.5        L.40        .063        L.05       L.007         .07        L.01          8.
          25TH              L.5         L.4        .200        L.05       L.007         .10       L.010         11.
   MEDIAN 50TH               .6        L.40        .420        L.05        .013         .19         .07         19.
          75TH               .9         L.4        .660         .08        .021         .30         .11         37.
          90TH            1.020         .90        .770         .10        .076         .35         .24         55.
SECONDARY CODE            01L

                          10474L      10453L      00205L      36001L      36011L      36102L      36910L      29009L
                          RESIDUE     RESIDUE      TOTAL     COLIFORMS   COLIFORMS    STREP.    STD. PLATE    COPPER
                           TOTAL     FILTRABLE   DISSOLVED     TOTAL       FECAL       FECAL       COUNT       TOTAL
                                                  SOLIDS                                        BACT.DENS.
                   SUBM                                        MPN         MPN         MF                      CU
                    ID     MG/L        MG/L        MG/L     NO/100ML    NO/100ML    NO/100ML      NO/ML        MG/L
SAMPLES(FLAGS)            14(0)       14(0)       21(0)       19(0)       19(0)       19(0)       17(0)       21(6)
           LOW             251.        200.        137.       2000.        130.         20.         30.       L.001
          HIGH             334.        320.        210.      37000.      19000.       1300.      23000.        .022
       AVERAGE             288.        256.        183.       9842.       3069.        285.       5866.        .003*
      STD.DEV.              29.         33.         17.       8783.       5378.        321.       6073.        .004*
  PERCNT:10TH              258.        220.        164.       2000.        230.         20.        440.       L.001
          25TH             262.        230.        175.       4100.        420.         90.       1900.       L.001
   MEDIAN 50TH             279.        250.        185.       5800.       1100.        140.       4400.        .002
          75TH             307.        290.        195.      13000.       3100.        430.       5600.        .003
          90TH             328.        290.        202.      22000.      17000.        760.      13000.        .004
SECONDARY CODE                                              02L         12L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  18                          NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                          SURFACE WATER DATA
STATION 00AL05EB2373    LAT. 53D 42M 47S  LONG. 113D 14M 20S   PR 3   UTM 12 352250E 5953700N  FOR MAY 18, 1982 TO FEB 29, 1984
 NORTH SASKATCHEWAN RIVER    RIGHT BANK      ABOVE FORT SASK. RAILWAY TRESTLE
 90M UPSTREAM
                          30009L      26304L      13306L      25003L      28009L      42009L      27009L      33005L
                           ZINC        IRON      ALUMINUM   MANGANESE     NICKEL    MOLYBDENUM    COBALT     ARSENIC
                          TOTAL      EXTRBLE.    EXTRBLE.     TOTAL       TOTAL       TOTAL       TOTAL       TOTAL

                 SUBM      ZN          FE          AL          MN          NI          MO          CO          AS
                  ID      MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            21(0)       21(0)       17(0)       18(0)       21(3)       17(15)      21(20)      13(2)
           LOW             .003         .05        .050        .009       L.001       L.001       L.001      L.0002
          HIGH             .064        2.24       4.600        .093        .011        .007        .003       .0023
       AVERAGE             .023         .47        .558        .030        .005*       .002*       .001*      .0006*
      STD.DEV.             .022         .53       1.084        .027        .003*       .002*       .000*      .0006*
   PERCNT:10TH             .004         .06        .050        .010       L.001       L.001       L.001      L.0002
          25TH             .005         .12        .138        .011        .004       L.001       L.001       .0003
   MEDIAN 50TH             .013         .26        .224        .017        .005       L.001       L.001       .0004
          75TH             .033         .62        .384        .038        .006       L.001       L.001       .0008
          90TH             .061         .77       1.110        .085        .008        .005       L.001       .0009
SECONDARY CODE
                          04304L      48009L      24009L      82302L      82009L      80015L      34005L      23009L
                         BERYLLIUM    CADMIUM    CHROMIUM      LEAD        LEAD      MERCURY    SELENIUM    VANADIUM
                          EXTRBLE.     TOTAL       TOTAL     EXTRBLE.      TOTAL       TOTAL      TOTAL       TOTAL

                 SUBM      BE          CD          CR          PB          PB          HG          SE          V
                  ID      MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            17(17)      21(18)      21(6)       9(6)        10(5)       11(11)      13(11)      17(8)
           LOW            L.001       L.001       L.001       L.003       L.003      L.0001      L.0002       L.002
          HIGH            L.001        .002        .027        .006        .072      L.0001       .0006        .013
       AVERAGE                         .001*       .005*       .004*       .011*                  .0003*       .004*
      STD.DEV.                         .000*       .006*       .002*       .021*                  .0001*       .003*
   PERCNT:10TH            L.001       L.001       L.001                   L.003      L.0001      L.0002       L.002
          25TH            L.001       L.001       L.001       L.003       L.003      L.0001      L.0002       L.002
   MEDIAN 50TH            L.001       L.001        .004       L.003        .004*     L.0001      L.0002        .003
          75TH            L.001       L.001        .006        .004        .007      L.0001      L.0002        .005
          90TH            L.001        .002        .008                    .040      L.0001       .0005        .008
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  19                          NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                            SURFACE WATER DATA
STATION 00AL05EB2441    LAT. 53D 46M 32S  LONG. 113D  9M 30S   PR 3   UTM 12 357800E 5960500N  FOR MAY 18, 1982 TO OCT 20, 1982
 NORTH SASKATCHEWAN RIVER    LEFT BANK     DOWNSTREAM OF STURGEON RIVER
 AT NGL PIPELINE CROSSING

                        97251F        02065F        08102F        02042F        02041L        10301L        08202L        08301L
                       DEPTH OF    TEMPERATURE      OXYGEN       SPECIFIC      SPECIFIC         PH          OXYGEN        OXYGEN
                       SAMPLING       WATER       DISSOLVED      CONDUCT.      CONDUCT.                     BIOCHEM.    TOTAL COD
                                                                                                          DEMAND-BOD
                  SUBM  FROM SURF.                    02                                                       02            02
                   ID      M           DEG.C         MG/L        USIE/CM        US/CM       PH UNITS         MG/L          MG/L
SAMPLES(FLAGS)            11(0)        11(0)        11(0)        11(0)         11(0)         11(0)          10(2)         11(0)
           LOW              1.5          4.5          7.3         320.          278.           7.8            L.3           11.
          HIGH              2.7         21.          13.4         500.          452.           8.5            3.4           56.
       AVERAGE              2.0         15.9          9.8         394.          363.                          1.7*          26.5
      STD.DEV.               .3          5.3          1.9          53.           48.                          1.1*          12.5
   PERCNT:10TH              1.7          7.5          8.4         340.          306.           7.8            L.3           15.
          25TH              1.7         15.           8.5         345.          324.           7.9             .8           21.
   MEDIAN 50TH              1.8         17.5          9.4         390.          365.           8.0            1.4           24.
          75TH              2.1         20.          12.0         430.          382.           8.2            2.7           26.
          90TH              2.4         20.5         12.5         430.          410.           8.4            3.2           42.
SECONDARY CODE

                        06536L        06005L        06154L        06107L        06905L        06715L        06721L        10151L
                       PHENOLIC       CARBON        CARBON        CARBON        CARBON       CHLORO -    CHLOROPHYLL   ALKALINITY
                       MATERIAL       TOTAL       DISSOLVED     DISSOLVED    PARTICULATE     PHYLL A          -A-          PHENOL
                        PHENOL       ORGANIC      INORGANIC      ORGANIC        TOTAL                     EPILITHON     PHTHALEIN
                  SUBM                  C             C             C             C                                      CACO3
                   ID    MG/L          MG/L         MG/L          MG/L          MG/L          MG/M3          MG/M2          MG/L
SAMPLES(FLAGS)          11(10)         9(0)                                                                               11(1)
           LOW           L.002           8.                                                                                 .0
          HIGH            .002          18.                                                                               L4.2
       AVERAGE            .002*         13.2                                                                                .4*
      STD.DEV.            .000*          3.5                                                                               1.3*
   PERCNT:10TH           L.002                                                                                              .0
          25TH           L.002          11.4                                                                                .0
   MEDIAN 50TH           L.002          12.                                                                                0.
          75TH           L.002          15.6                                                                               0.
          90TH           L.002                                                                                             0.
SECONDARY CODE

                        10101L        06301L        06201L        17203L        16306L        09107L        14102L        10602L
                      ALKALINITY    CARBONATE     BICARBONT.     CHLORIDE      SULPHATE      FLUORIDE       SILICA       HARDNESS
                         TOTAL       (CALCD.)       (CALCD.)     DISSOLVED     DISSOLVED     DISSOLVED     REACTIVE        TOTAL
                                                                                                                        (CALCD.)
                  SUBM   CACO3          CO3         HCO3            CL           SO4             F            SIO2          CACO3
                   ID    MG/L          MG/L        MG/L            MG/L          MG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)           11(0)         11(1)         11(1)         11(3)         11(0)         11(0)         11(0)         11(0)
           LOW            117.            0.          143.           L0.           20.           .13           2.4          116.
          HIGH            172.           Q5.          210.            5.           47.           .16           5.3          167.
       AVERAGE            146.            0.*         176.*          2.5*          34.           .15           3.9          149.
      STD.DEV.             17.            2.*          20.*          1.4*           8.           .01            .9           14.
   PERCNT:10TH            121.            0.          147.           L0.           25.           .13           3.0          136.
          25TH            135.            0.          165.           L0.           30.           .14           3.2          144.
   MEDIAN 50TH            151.            0.          180.            2.           35.           .15           3.8          149.
          75TH            155.            0.          189.            3.           40.           .16           4.5          160.
          90TH            160.            0.          195.            5.           40.           .16           5.2          164.
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  20                    NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                    SURFACE WATER DATA
STATION 00AL05EB2441    LAT. 53D 46M 32S  LONG. 113D  9M 30S   PR 3   UTM 12 357800E 5960500N  FOR MAY 18, 1982 TO OCT 20, 1982
 NORTH SASKATCHEWAN RIVER     LEFT BANK     DOWNSTREAM OF STURGEON RIVER
 AT NGL PIPELINE CROSSING
                           20110L       12102L       11103L       19103L        15406L       15419L       07403L       07602L
                           CALCIUM     MAGNESIUM     SODIUM      POTASSIUM   PHOSPHOROUS   PHOSPHORUS    NITROGEN     NITROGEN
                          DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED      TOTAL        TOTAL      TOTAL ORG.     TOTAL
                                                                              PHOSPHATE    PHOSPHATE    (CALCD.)     (CALCD.)
                    SUBM     CA           MG           NA           K             P            P            N            N
                     ID     MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)              11(0)        11(0)        11(0)        11(0)         9(0)         5(0)        11(11)        11(8)
           LOW                35.           7.           4.          1.0          .018         .068        Q.100        Q.550
          HIGH                47.          12.          22.          7.5          .141         .098        Q.800        Q1.250
       AVERAGE                42.         10.8         11.1          2.9          .087         .078                      .707*
      STD.DEV.                 4.          1.5          5.4          1.9          .036         .012                      .221*
  PERCNT:10TH                 38.          10.           4.          1.1                                   Q.100        Q.550
          25TH                40.          10.           8.          1.4           .07         .070        Q.100        Q.550
   MEDIAN 50TH                41.          11.          11.          2.8          .083         .077        Q.200        Q.650
          75TH                46.          12.          14.          4.0          .102         .079        Q.200         .700
          90TH                46.          12.          18.          4.0                                   Q.500        1.000
SECONDARY CODE                                                                                 21L
                           07021L       07503L       07562L       07205L       07206L       07105L       07906L        10407L
                          NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN      RESIDUE
                            TOTAL        TOTAL      DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED   PARTICULATE  NONFILTRABLE
                          KJELDAHL      AMMONIA      AMMONIA      NITRITE      NITRITE     NO3 & NO2      TOTAL
                    SUBM     N            N            N            N            N            N            N
                     ID     MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)              11(1)        11(11)        5(1)        11(10)        11(6)        11(8)                      4(0)
           LOW               .360          L.4       L.002         L.05        L.007         L.05                        14.
          HIGH               1.2           L.4        .115          .07         .016          .10                        22.
       AVERAGE               .625*                    .070*        .052*        .009*        .062*                       18.
      STD.DEV.               .216*                    .042*        .006*        .003*        .021*                        3.
  PERCNT:10TH                L.5           L.4                     L.05        L.007         L.05
          25TH                .5           L.4        .062         L.05        L.007         L.05                        16.
   MEDIAN 50TH                .6           L.4        .084         L.05        L.007         L.05                        17.
          75TH               .680          L.4        .087         L.05         .012          .08                        20.
          90TH               .740          L.4                     L.05         .014          .10
SECONDARY CODE              01L
                           10474L       10453L       00205L       36001L       36011L       36102L       36910L        29009L
                           RESIDUE      RESIDUE       TOTAL      COLIFORMS    COLIFORMS     STREP.     STD. PLATE     COPPER
                            TOTAL      FILTRABLE    DISSOLVED      TOTAL        FECAL        FECAL        COUNT         TOTAL
                                                     SOLIDS                                            BACT.DENS.
                                                                    MPN          MPN          MF                        CU
                    SUBM
                     ID     MG/L         MG/L         MG/L       NO/100ML     NO/100ML     NO/100ML       NO/ML        MG/L
SAMPLES(FLAGS)               4(0)         4(0)        11(0)        11(0)        11(0)        11(0)         9(0)        11(1)
           LOW               304.         290.         138.          20.          10.          28.          70.        L.001
          HIGH               342.         320.         237.        8500.         510.         300.        3600.         .005
       AVERAGE               323.         305.         191.        3502.         349.         108.        1580.         .003*
      STD.DEV.                16.          13.          27.        2657.         150.          81.        1301.         .001*
  PERCNT:10TH                                         162.        1000.         250.          30.                      .002
          25TH               311.         295.         174.        1200.         250.          44.         710.         .002
   MEDIAN 50TH               322.         305.         191.        3000.         420.          90.        1200.         .003
          75TH               335.         315.         207.        5200.         450.         150.        2400.         .004
          90TH                                         212.        7600.         510.         160.                      .004
SECONDARY CODE                                                      02L          12L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  21                     NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                     SURFACE WATER DATA
STATION 00AL05EB2441    LAT. 53D 46M 32S  LONG. 113D  9M 30S   PR 3   UTM 12 357800E 5960500N  FOR MAY 18, 1982 TO OCT 20, 1982
 NORTH SASKATCHEWAN RIVER     LEFT BANK     DOWNSTREAM OF STURGEON RIVER
 AT NGL PIPELINE CROSSING

                       30009L        26304L        13306L        25003L        28009L        42009L        27009L        33005L
                        ZINC          IRON         ALUMINUM     MANGANESE      NICKEL     MOLYBDENUM      COBALT        ARSENIC
                       TOTAL         EXTRBLE.      EXTRBLE.      TOTAL         TOTAL         TOTAL         TOTAL        TOTAL

               SUBM     ZN             FE            AL            MN            NI             MO           CO            AS
                ID      MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)          11(0)         11(0)          7(0)          8(0)         11(1)          7(6)        11(10)          6(1)
           LOW            .006           .06          .346          .013         L.001         L.001         L.001        L.0002
          HIGH            .064          1.78         5.120          .115          .010          .005          .003         .0012
       AVERAGE            .025           .50         1.170          .037          .006*         .002*         .001*        .0009*
      STD.DEV.            .016           .50         1.756          .034          .003*         .002*         .001*        .0004*
   PERCNT:10TH            .014           .12                                      .003                       L.001
          25TH            .014           .15          .361          .019          .004         L.001         L.001         .0007
   MEDIAN 50TH            .023           .31          .455          .019          .005         L.001         L.001         .0010
          75TH            .031           .56         1.000          .045          .009         L.001         L.001         .0012
          90TH            .034          1.00                                      .009                       L.001
SECONDARY CODE

                       04304L        48009L        24009L        82302L        82009L        80015L        34005L        23009L
                       BERYLLIUM     CADMIUM       CHROMIUM       LEAD          LEAD        MERCURY      SELENIUM       VANADIUM
                        EXTRBLE.     TOTAL         TOTAL        EXTRBLE.       TOTAL         TOTAL       TOTAL           TOTAL

               SUBM     BE             CD            CR            PB           PB            HG             SE           V
                ID      MG/L          MG/L          MG/L         MG/L           MG/L          MG/L           MG/L         MG/L
SAMPLES(FLAGS)           7(7)        11(11)         11(0)                       11(8)                        6(4)          7(3)
           LOW           L.001         L.001          .003                       L.003                      L.0002         L.002
          HIGH           L.001         L.001          .009                        .006                       .0004          .015
       AVERAGE                                        .006                        .003*                      .0002*         .005*
      STD.DEV.                                        .001                        .001*                      .0001*         .005*
   PERCNT:10TH                         L.001          .005                       L.003
          25TH           L.001         L.001          .005                       L.003                      L.0002         L.002
   MEDIAN 50TH           L.001         L.001          .006                       L.003                      L.0002          .003
          75TH           L.001         L.001          .006                        .004                       .0003          .006
          90TH                         L.001          .007                        .004
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  22                    NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                    SURFACE WATER DATA
STATION 00AL05EB2442    LAT. 53D 46M 30S  LONG. 113D  9M 25S   PR 3   UTM 12 357850E 5960450N  FOR MAY 18, 1982 TO OCT 20, 1982
 NORTH SASKATCHEWAN RIVER        CENTRE     DOWNSTREAM OF STURGEON RIVER
 AT NGL PIPELINE CROSSING

                         97251F       02065F       08102F       02042F       02041L       10301L       08202L       08301L
                        DEPTH OF    TEMPERATURE    OXYGEN      SPECIFIC     SPECIFIC       PH          OXYGEN       OXYGEN
                        SAMPLING       WATER      DISSOLVED    CONDUCT.     CONDUCT.                  BIOCHEM.    TOTAL COD
                                                                                                     DEMAND-BOD
                 SUBM  FROM SURF.                    02                                                  02           02
                  ID       M          DEG.C        MG/L       USIE/CM       US/CM       PH UNITS       MG/L         MG/L
SAMPLES(FLAGS)           11(0)        11(0)        11(0)        11(0)        11(0)        11(0)        11(1)        11(0)
           LOW             1.5          4.5          7.4         310.         274.          8.0          L.3          4.5
          HIGH             3.4          21.         12.6         430.         374.          8.5          2.8          26.
       AVERAGE             2.5         14.8          9.5         371.         331.                       1.6*        13.3
      STD.DEV.              .5          5.3          1.7          38.          30.                        .9*         5.6
  PERCNT:10TH              2.1          7.6          8.1         335.         292.          8.0           .7          7.7
          25TH             2.4          9.5          8.3         340.         318.          8.0           .8          11.
   MEDIAN 50TH             2.4         16.5          8.7         370.         332.          8.1          1.6          13.
          75TH             2.9         18.5         10.7         410.         356.          8.3          2.4          16.
          90TH             3.0          20.         11.9         410.         357.          8.4          2.8          18.
SECONDARY CODE

                         06536L       06005L       06154L       06107L       06905L       06715L       06721L       10151L
                        PHENOLIC      CARBON       CARBON       CARBON       CARBON      CHLORO -   CHLOROPHYLL  ALKALINITY
                        MATERIAL      TOTAL      DISSOLVED    DISSOLVED   PARTICULATE    PHYLL A        -A-         PHENOL
                         PHENOL      ORGANIC     INORGANIC     ORGANIC       TOTAL                   EPILITHON   PHTHALEIN
                 SUBM                   C            C            C            C                                  CACO3
                  ID      MG/L        MG/L         MG/L         MG/L         MG/L         MG/M3        MG/M2        MG/L
SAMPLES(FLAGS)           11(10)        9(0)                                                                     11(2)
           LOW            L.002          6.                                                                        .0
          HIGH             L.02        10.9                                                                      L4.2
       AVERAGE            .004*         8.3                                                                        .8*
      STD.DEV.            .005*         1.4                                                                       1.7*
  PERCNT:10TH             L.002                                                                                    .0
          25TH            L.002         7.5                                                                        .0
   MEDIAN 50TH            L.002         8.3                                                                        .0
          75TH            L.002          9.                                                                        0.
          90TH             .002                                                                                  L4.2
SECONDARY CODE

                         10101L       06301L       06201L       17203L       16306L       09107L       14102L       10602L
                       ALKALINITY   CARBONATE    BICARBONT.    CHLORIDE     SULPHATE     FLUORIDE      SILICA      HARDNESS
                          TOTAL      (CALCD.)      (CALCD.)    DISSOLVED    DISSOLVED    DISSOLVED    REACTIVE       TOTAL
                                                                                                                   (CALCD.)
                 SUBM     CACO3         CO3        HCO3           CL          SO4           F           SIO2         CACO3
                  ID      MG/L         MG/L        MG/L          MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)           11(0)        11(2)        11(2)        11(5)        11(0)        11(0)        11(0)        11(0)
           LOW            116.           0.        Q134.          L0.          20.          .12          3.2         114.
          HIGH            150.          Q5.         180.           3.          40.          .15          5.4         165.
       AVERAGE            134.          1.*        162.*         1.6*          30.          .14          4.1         147.
      STD.DEV.             11.          2.*         14.*          .7*           8.          .01           .7          17.
  PERCNT:10TH             118.           0.         141.          L0.          20.          .14          3.2         122.
          25TH            127.           0.         155.          L0.          20.          .14          3.5         139.
   MEDIAN 50TH            135.           0.         165.           2.          30.          .14          4.1         151.
          75TH            145.           0.        Q173.           2.          35.          .15          4.3         161.
          90TH            148.          Q5.         177.           2.          40.          .15          5.2         164.
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  23                     NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                    SURFACE WATER DATA
STATION 00AL05EB2442    LAT. 53D 46M 30S  LONG. 113D  9M 25S   PR 3   UTM 12 357850E 5960450N  FOR MAY 18, 1982 TO OCT 20, 1982
 NORTH SASKATCHEWAN RIVER         CENTRE     DOWNSTREAM OF STURGEON RIVER
 AT NGL PIPELINE CROSSING

                         20110L      12102L      11103L      19103L      15406L      15419L      07403L      07602L
                        CALCIUM    MAGNESIUM     SODIUM    POTASSIUM  PHOSPHOROUS  PHOSPHORUS   NITROGEN    NITROGEN
                       DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED     TOTAL       TOTAL     TOTAL ORG.     TOTAL
                                                                       PHOSPHATE   PHOSPHATE    (CALCD.)    (CALCD.)
                  SUBM     CA          MG          NA          K           P           P           N           N
                   ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           11(0)       11(0)       11(0)       11(0)        9(0)        5(0)       11(9)       11(5)
           LOW              34.          7.          2.          .6        .021        .089       Q.100       Q.550
          HIGH              48.         13.          8.         1.3        .123        .117       Q.400       1.050
       AVERAGE              41.         10.5         5.5        1.0        .092        .101        .236*       .750*
      STD.DEV.               4.          1.7         1.9         .2        .030        .012        .129*       .196*
  PERCNT:10TH               34.          9.          3.          .8                               Q.100       Q.550
          25TH              39.         10.          4.          .9        .094        .094       Q.100       Q.550
   MEDIAN 50TH              43.         10.          6.         1.0        .099        .094       Q.200        .700
          75TH              44.         12.          7.         1.1        .111        .109       Q.400        .900
          90TH              46.         12.          7.         1.2                               Q.400       1.020
SECONDARY CODE                                                                         21L

                         07021L      07503L      07562L      07205L      07206L      07105L      07906L      10407L
                        NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    RESIDUE
                         TOTAL       TOTAL     DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED  PARTICULATE NONFILTRABLE
                        KJELDAHL    AMMONIA     AMMONIA     NITRITE     NITRITE    NO3 & NO2     TOTAL
                  SUBM     N           N           N           N           N           N           N
                   ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           11(2)       11(9)        5(0)       11(7)       11(2)       11(5)                    4(0)
           LOW             .380        L.4         .009        L.05       L.007        L.05                     10.
          HIGH             .8           .4         .258         .10        .054         .25                     27.
       AVERAGE             .546*        .40*       .180         .060*      .018*        .114*                   19.
      STD.DEV.             .104*        .00*       .101         .016*      .015*        .075*                    9.
  PERCNT:10TH              .480        L.4                      L.05       L.007        L.05
          25TH             L.5         L.4         .181         L.05        .007        L.05                    11.
   MEDIAN 50TH             .540        L.4         .202         L.05        .013         .10                    19.
          75TH             .6          L.4         .248          .07        .026         .18                    26.
          90TH             .6           .4                       .07        .038         .22
SECONDARY CODE           01L

                         10474L      10453L      00205L      36001L      36011L      36102L      36910L      29009L
                        RESIDUE     RESIDUE      TOTAL     COLIFORMS   COLIFORMS     STREP.   STD. PLATE    COPPER
                         TOTAL     FILTRABLE   DISSOLVED     TOTAL       FECAL       FECAL       COUNT       TOTAL
                                                SOLIDS                                        BACT.DENS.
                  SUBM                                        MPN         MPN         MF                     CU
                   ID     MG/L        MG/L        MG/L     NO/100ML    NO/100ML    NO/100ML      NO/ML       MG/L
SAMPLES(FLAGS)            4(0)        4(0)       11(0)       11(0)       11(0)       11(0)       10(0)       11(1)
           LOW             252.        240.        137.       1400.        560.         48.        240.       L.001
          HIGH             307.        290.        201.      11000.       2100.        400.       5200.        .005
       AVERAGE             286.        268.        171.       7309.       1053.        190.       1915.        .003*
      STD.DEV.              24.         22.         18.       3234.        478.        119.       1562.        .001*
  PERCNT:10TH                                      153.       3100.        590.         80.        360.        .002
          25TH             269.        250.        160.       5500.        700.         94.        680.        .002
   MEDIAN 50TH             293.        270.        175.       7500.        990.        150.       1600.        .002
          75TH             304.        285.        182.      11000.       1400.        310.       2500.        .004
          90TH                                     189.      11000.       1500.        330.       4400.        .005
SECONDARY CODE                                                 02L         12L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  24                    NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                      SURFACE WATER DATA
STATION 00AL05EB2442    LAT. 53D 46M 30S  LONG. 113D  9M 25S   PR 3   UTM 12 357850E 5960450N  FOR MAY 18, 1982 TO OCT 20, 1982
 NORTH SASKATCHEWAN RIVER        CENTRE     DOWNSTREAM OF STURGEON RIVER
 AT NGL PIPELINE CROSSING

                          30009L       26304L       13306L       25003L       28009L       42009L       27009L       33005L
                           ZINC         IRON        ALUMINUM    MANGANESE     NICKEL     MOLYBDENUM     COBALT      ARSENIC
                          TOTAL       EXTRBLE.     EXTRBLE.      TOTAL        TOTAL        TOTAL        TOTAL       TOTAL

                   SUBM     ZN           FE           AL           MN           NI           MO           CO           AS
                    ID     MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)            11(0)        11(0)         7(0)         8(1)        11(0)         7(6)        11(10)        6(1)
           LOW              .002          .06          .119        L.008          .003        L.001        L.001       L.0002
          HIGH              .043         2.11         5.390         .100          .009         .004         .003        .0011
       AVERAGE              .022          .46         1.284         .032*         .005         .001*        .001*       .0006*
      STD.DEV.              .013          .58         1.894         .031*         .002         .001*        .001*       .0004*
   PERCNT:10TH              .009          .08                                     .004                     L.001
          25TH              .011          .16          .250         .010          .004        L.001        L.001        .0003
   MEDIAN 50TH              .021          .29          .478         .019          .005        L.001        L.001        .0004
          75TH              .033          .55         1.780         .045          .007        L.001        L.001        .0009
          90TH              .034          .66                                     .007                     L.001
SECONDARY CODE

                          04304L       48009L       24009L       82302L       82009L       80015L       34005L       23009L
                         BERYLLIUM     CADMIUM     CHROMIUM       LEAD         LEAD        MERCURY     SELENIUM     VANADIUM
                          EXTRBLE.     TOTAL        TOTAL       EXTRBLE.      TOTAL        TOTAL       TOTAL        TOTAL

                   SUBM     BE           CD           CR           PB           PB           HG           SE           V
                    ID     MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)             7(7)        11(9)        11(0)                     11(8)                      6(5)         7(2)
           LOW             L.001        L.001         .003                     L.003                     L.0002        L.002
          HIGH             L.001         .003         .009                      .004                      .0004         .014
       AVERAGE                           .001*        .006                      .003*                     .0002*        .005*
      STD.DEV.                           .001*        .002                      .000*                     .0001*        .004*
   PERCNT:10TH                          L.001         .004                     L.003
          25TH             L.001        L.001         .005                     L.003                     L.0002        L.002
   MEDIAN 50TH             L.001        L.001         .006                     L.003                     L.0002         .003
          75TH             L.001        L.001         .007                      .004                     L.0002         .007
          90TH                           .002         .007                      .004
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  25                        NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                          SURFACE WATER DATA
STATION 00AL05EB2443    LAT. 53D 46M 28S  LONG. 113D  9M 21S   PR 3   UTM 12 357950E 5960350N  FOR MAY 18, 1982 TO OCT 20, 1982
 NORTH SASKATCHEWAN RIVER   RIGHT BANK     DOWNSTREAM OF STURGEON RIVER
 AT NGL PIPELINE CROSSING

                         97251F       02065F        08102F       02042F       02041L        10301L        08202L        08301L
                        DEPTH OF    TEMPERATURE     OXYGEN      SPECIFIC     SPECIFIC         PH          OXYGEN        OXYGEN
                        SAMPLING       WATER      DISSOLVED     CONDUCT.     CONDUCT.                    BIOCHEM.     TOTAL COD
                                                                                                        DEMAND-BOD
                   SUBM  FROM SURF.                   O2                                                    O2            O2
                    ID       M          DEG.C        MG/L       USIE/CM        US/CM       PH UNITS        MG/L          MG/L
SAMPLES(FLAGS)            11(0)         11(0)        11(0)        11(0)        10(0)         10(0)         11(0)         11(0)
           LOW                .6          4.5          6.8         290.         278.           7.7            .6           6.7
          HIGH               2.4         21.5         12.6         480.         412.           8.3           4.2          26.
       AVERAGE               1.4         15.8          9.3         391.         356.                         2.5          14.7
      STD.DEV.                .7          5.2          1.8          54.          37.                         1.3           5.1
   PERCNT:10TH                .6           8.          7.8         350.         302.           7.7           1.4          10.
          25TH                .9         14.5          7.8         355.         339.           7.8           1.4          12.
   MEDIAN 50TH               1.2          17.          8.7         390.         356.           7.8           1.9          14.
          75TH               2.1         19.5         11.2         430.         382.           8.0           3.8          17.
          90TH               2.1          20.         11.5         445.         400.           8.2           4.1          20.
SECONDARY CODE

                         06536L       06005L        06154L       06107L       06905L        06715L        06721L        10151L
                        PHENOLIC      CARBON        CARBON       CARBON       CARBON       CHLORO -     CHLOROPHYLL   ALKALINITY
                        MATERIAL       TOTAL       DISSOLVED    DISSOLVED   PARTICULATE    PHYLL A          -A-          PHENOL
                         PHENOL       ORGANIC      INORGANIC     ORGANIC       TOTAL                     EPILITHON     PHTHALEIN
                   SUBM                  C             C            C            C                                      CACO3
                    ID    MG/L         MG/L          MG/L         MG/L         MG/L          MG/M3         MG/M2         MG/L
SAMPLES(FLAGS)           11(10)        10(0)                                                                          10(0)
           LOW            L.002          5.                                                                              .0
          HIGH             .003         12.                                                                             0.
       AVERAGE             .002*         9.6                                                                             .0
      STD.DEV.             .000*         2.3                                                                             .0
   PERCNT:10TH            L.002          6.2                                                                             .0
          25TH            L.002          8.2                                                                             .0
   MEDIAN 50TH            L.002         10.2                                                                             .0
          75TH            L.002         11.7                                                                            0.
          90TH            L.002         12.0                                                                             .0
SECONDARY CODE

                         10101L       06301L        06201L       17203L       16306L        09107L        14102L        10602L
                       ALKALINITY    CARBONATE    BICARBONT.    CHLORIDE     SULPHATE      FLUORIDE       SILICA       HARDNESS
                          TOTAL       (CALCD.)      (CALCD.)    DISSOLVED    DISSOLVED     DISSOLVED     REACTIVE        TOTAL
                                                                                                                      (CALCD.)
                   SUBM   CACO3          CO3         HCO3           CL          SO4            F            SIO2          CACO3
                    ID    MG/L          MG/L        MG/L           MG/L         MG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)           10(0)         10(0)         10(0)        10(1)        10(0)         10(0)         10(0)         10(0)
           LOW             116.           0.          141.          L0.          20.           .14           2.8          119.
          HIGH             151.           0.          184.          8.           45.           .20           5.5          178.
       AVERAGE             136.           0.          165.          4.4*         33.           .16           4.1          154.
      STD.DEV.              10.           0.           12.          2.2*          8.           .02            .8           18.
   PERCNT:10TH             122.           0.          149.          1.5*         23.           .14           3.0          130.
          25TH             130.           0.          158.          3.           25.           .15           3.5          144.
   MEDIAN 50TH             136.           0.          165.          5.0          33.           .16           4.2          153.
          75TH             143.           0.          174.          5.           40.           .16           4.5          168.
          90TH             149.           0.          181.          7.5          43.           .19           5.3          175.
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  26                      NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                        SURFACE WATER DATA
STATION 00AL05EB2443    LAT. 53D 46M 28S  LONG. 113D  9M 21S   PR 3   UTM 12 357950E 5960350N  FOR MAY 18, 1982 TO OCT 20, 1982
 NORTH SASKATCHEWAN RIVER   RIGHT BANK     DOWNSTREAM OF STURGEON RIVER
 AT NGL PIPELINE CROSSING

                         20110L      12102L      11103L      19103L       15406L       15419L       07403L       07602L
                        CALCIUM    MAGNESIUM     SODIUM    POTASSIUM  PHOSPHOROUS   PHOSPHORUS    NITROGEN     NITROGEN
                       DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED     TOTAL        TOTAL      TOTAL ORG.     TOTAL
                                                                       PHOSPHATE    PHOSPHATE     (CALCD.)     (CALCD.)
                  SUBM     CA          MG          NA          K            P            P            N            N
                   ID     MG/L        MG/L        MG/L        MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)            10(0)       10(0)       10(0)       10(0)        9(0)         5(0)        11(4)        10(2)
           LOW              36.          7.          5.          .9         .036         .109       Q-.300        Q.640
          HIGH              50.         13.         13.         1.5         .299         .310        Q.900        1.900
       AVERAGE              43.         11.1         8.5        1.2         .158         .189         .373*       1.301*
      STD.DEV.               5.          1.9         2.4         .2         .075         .074         .224*        .346*
  PERCNT:10TH               38.          8.5         5.5        1.0                                  Q.100         .760
          25TH              40.         10.          6.         1.1         .111         .163         .200       Q1.200
   MEDIAN 50TH              42.         11.5         9.0        1.2         .176         .169         .300        1.350
          75TH              47.         13.          9.         1.2         .178         .196         .500        1.460
          90TH              50.         13.0        12.0        1.5                                   .600        1.700
SECONDARY CODE                                                                         21L

                         07021L      07503L      07562L      07205L       07206L       07105L       07906L       10407L
                        NITROGEN    NITROGEN    NITROGEN    NITROGEN     NITROGEN     NITROGEN     NITROGEN      RESIDUE
                         TOTAL       TOTAL     DISSOLVED   DISSOLVED    DISSOLVED    DISSOLVED   PARTICULATE  NONFILTRABLE
                        KJELDAHL    AMMONIA     AMMONIA     NITRITE      NITRITE     NO3 & NO2      TOTAL
                  SUBM     N           N           N           N            N            N            N
                   ID     MG/L        MG/L        MG/L        MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)            11(1)       11(3)       5(0)        10(5)        11(1)        10(0)                     4(0)
           LOW            L.5         L.4         .048        L.05         L.007         .10                       13.
          HIGH            1.600        .8        1.000         .30          .095         .70                       33.
       AVERAGE             .972*       .58*       .576         .112*        .035*        .381                      22.
      STD.DEV.             .360*       .17*       .392         .086*        .030*        .213                      10.
  PERCNT:10TH              .510       L.4                     L.050         .008         .120
          25TH             .7         L.4         .310        L.05          .014         .18                       13.
   MEDIAN 50TH             .960        .6         .676         .075*        .026         .420                      20.
          75TH            1.3          .7         .848         .14          .048         .55                       30.
          90TH            1.400        .8                      .260         .088         .650
SECONDARY CODE            01L

                         10474L      10453L      00205L      36001L       36011L       36102L       36910L       29009L
                        RESIDUE     RESIDUE      TOTAL     COLIFORMS    COLIFORMS      STREP.    STD. PLATE     COPPER
                         TOTAL     FILTRABLE   DISSOLVED     TOTAL        FECAL        FECAL        COUNT        TOTAL
                                                SOLIDS                                           BACT.DENS.
                  SUBM                                       MPN          MPN           MF                        CU
                   ID    MG/L        MG/L        MG/L      NO/100ML     NO/100ML     NO/100ML      NO/ML         MG/L
SAMPLES(FLAGS)            4(0)        4(0)       10(0)       11(0)        11(0)        11(0)        9(0)        11(2)
           LOW             223.        210.        146.       2300.         580.          24.        400.        L.001
          HIGH             347.        330.        223.      43000.       10000.        3000.      15000.         .024
       AVERAGE             299.        278.        184.      12782.        1987.         525.       6344.         .005*
      STD.DEV.              59.         57.         22.      14674.        2698.         886.       5846.         .007*
  PERCNT:10TH                                      157.       2400.         760.          40.                    L.001
          25TH             253.        230.        170.       4500.         920.          80.       2500.         .002
   MEDIAN 50TH             313.        285.        185.       7300.        1200.         200.       3500.         .003
          75TH             345.        325.        197.      10000.        1600.         490.      13000.         .005
          90TH                                     212.      41000.        2000.        1200.                     .008
SECONDARY CODE                                               02L          12L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  27                      NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                      SURFACE WATER DATA
STATION 00AL05EB2443    LAT. 53D 46M 28S  LONG. 113D  9M 21S   PR 3   UTM 12 357950E 5960350N  FOR MAY 18, 1982 TO OCT 20, 1982
 NORTH SASKATCHEWAN RIVER   RIGHT BANK     DOWNSTREAM OF STURGEON RIVER
 AT NGL PIPELINE CROSSING

                          30009L     26304L     13306L     25003L     28009L     42009L     27009L     33005L
                           ZINC       IRON     ALUMINUM  MANGANESE   NICKEL   MOLYBDENUM   COBALT    ARSENIC
                          TOTAL     EXTRBLE.   EXTRBLE.    TOTAL      TOTAL      TOTAL      TOTAL     TOTAL

                   SUBM     ZN         FE         AL         MN         NI         MO         CO         AS
                    ID     MG/L       MG/L       MG/L       MG/L       MG/L       MG/L       MG/L       MG/L
SAMPLES(FLAGS)            11(0)      10(0)       7(0)       8(0)      11(0)       7(6)      11(6)       6(1)
           LOW             .017        .05       .219       .011       .006      L.001      L.001     L.0002
          HIGH             .057        .90      4.300       .107       .105       .004       .006      .0015
       AVERAGE             .037        .30      1.265       .035       .022       .001*      .002*     .0007*
      STD.DEV.             .011        .25      1.601       .032       .028       .001*      .002*     .0006*
  PERCNT:10TH              .027        .06                             .008                 L.001
          25TH             .034        .16       .261       .015       .009      L.001      L.001      .0003
   MEDIAN 50TH             .037        .20       .519       .020       .011      L.001      L.001      .0005
          75TH             .045        .43      2.700       .046       .020      L.001       .003      .0013
          90TH             .048        .68                             .029                  .004
SECONDARY CODE

                          04304L     48009L     24009L     82302L     82009L     80015L     34005L     23009L
                         BERYLLIUM   CADMIUM   CHROMIUM     LEAD       LEAD     MERCURY   SELENIUM   VANADIUM
                          EXTRBLE.    TOTAL      TOTAL    EXTRBLE.     TOTAL      TOTAL    TOTAL       TOTAL

                   SUBM     BE         CD         CR         PB         PB         HG         SE         V
                    ID     MG/L       MG/L       MG/L       MG/L       MG/L       MG/L       MG/L       MG/L
SAMPLES(FLAGS)             7(7)      11(9)      11(0)                 11(7)                  6(5)       7(3)
           LOW            L.001      L.001       .005                 L.003                 L.0002      L.002
          HIGH            L.001       .005       .010                  .050                  .0004       .012
       AVERAGE                        .002*      .007                  .008*                 .0002*      .005*
      STD.DEV.                        .001*      .002                  .014*                 .0001*      .004*
  PERCNT:10TH                        L.001       .005                 L.003
          25TH            L.001      L.001       .006                 L.003                 L.0002      L.002
   MEDIAN 50TH            L.001      L.001       .007                 L.003                 L.0002       .003
          75TH            L.001      L.001       .008                  .006                 L.0002       .010
          90TH                        .003       .008                  .008
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

NAQUADAT SUMMARY REPORT APR 30, 1986
SURFACE WATER DATA

STATION 00AL05EB2505 LAT. 53D 50M 45S LONG. 113D 1M 24S PR 4 UTM 12 366900E 5968000N FOR MAY 26, 1983 TO NOV 16, 1983
REDWATER RIVER - MOUTH

	97251F DEPTH OF SAMPLING	02065F TEMPERATURE WATER	08102F OXYGEN DISSOLVED	02042F SPECIFIC CONDUCT.	02041L SPECIFIC CONDUCT.	10301L PH	08202L OXYGEN BIOCHEM. DEMAND-BOD	08301L OXYGEN TOTAL COD
SUBM ID	FROM SURF. M	DEG.C	O2 MG/L	USIE/CM	US/CM	PH UNITS	O2 MG/L	O2 MG/L
SAMPLES(FLAGS)	5(0)	9(0)	9(0)	9(0)	9(0)	9(0)	7(0)	9(0)
LOW	.3	1.5	5.2	450.	396.	7.8	1.6	12.7
HIGH	.6	23.0	12.2	940.	964.	8.4	3.4	81.5
AVERAGE	.4	16.4	8.9	671.	607.		2.6	58.8
STD.DEV.	.2	6.7	2.2	144.	179.		.6	23.4
PERCNT:10TH								
25TH	.3	15.	8.0	590.	475.	7.9	2.4	45.6
MEDIAN 50TH	.5	19.5	8.9	650.	576.	8.1	2.6	64.7
75TH	.6	20.5	9.8	700.	664.	8.2	2.9	80.4
90TH								
SECONDARY CODE								04L

	06536L PHENOLIC MATERIAL PHENOL	06005L CARBON TOTAL ORGANIC	06154L CARBON DISSOLVED INORGANIC	06107L CARBON DISSOLVED ORGANIC	06905L CARBON PARTICULATE TOTAL	06715L CHLORO - PHYLL A	06721L CHLOROPHYLL -A- EPILITHON	10151L ALKALINITY PHENOL PHTHALEIN
SUBM ID	MG/L	C MG/L	C MG/L	C MG/L	C MG/L	MG/M3	MG/M2	CACO3 MG/L
SAMPLES(FLAGS)	9(0)		9(0)	9(0)	9(1)	9(0)		9(0)
LOW	.003		34.0	4.1	L.01	2.51		.0
HIGH	.020		62.0	31.0	7.41	26.63		4.2
AVERAGE	.011		47.1	19.1	1.97*	12.87		.5
STD.DEV.	.005		10.1	8.1	2.60*	9.97		1.4
PERCNT:10TH								
25TH	.009		39.0	15.0	.33	3.96		.0
MEDIAN 50TH	.009		47.0	20.0	.99	8.30		.0
75TH	.014		55.0	25.0	1.38	23.48		.0
90TH								
SECONDARY CODE	37L							

	10101L ALKALINITY TOTAL	06301L CARBONATE (CALCD.)	06201L BICARBONT. (CALCD.)	17203L CHLORIDE DISSOLVED	16306L SULPHATE DISSOLVED	09107L FLUORIDE DISSOLVED	14102L SILICA REACTIVE	10602L HARDNESS TOTAL (CALCD.)
SUBM ID	CACO3 MG/L	CO3 MG/L	HCO3 MG/L	CL MG/L	SO4 MG/L	F MG/L	SIO2 MG/L	CACO3 MG/L
SAMPLES(FLAGS)	9(0)	9(0)	9(0)	9(0)	9(0)	9(0)	9(0)	9(0)
LOW	140.	0.	160.	6.	42.	.19	.9	149.
HIGH	272.	5.	332.	77.	102.	.63	12.5	335.
AVERAGE	200.	1.	243.	35.7	58.	.27	6.2	221.
STD.DEV.	44.	2.	55.	28.6	21.	.14	4.6	53.
PERCNT:10TH								
25TH	176.	0.	215.	13.	42.	.21	2.3	192.
MEDIAN 50TH	191.	0.	233.	17.	50.	.21	4.4	212.
75TH	229.	0.	279.	58.	60.	.22	10.4	234.
90TH								
SECONDARY CODE								

* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q

```
REQUEST 0004 -  0006 PAGE  29                      NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                        SURFACE WATER DATA
STATION 00AL05EB2505    LAT. 53D 50M 45S  LONG. 113D  1M 24S   PR 4   UTM 12 366900E 5968000N  FOR MAY 26, 1983 TO NOV 16, 1983
 REDWATER RIVER  -  MOUTH

                          20110L       12102L       11103L       19103L       15406L       15419L       07403L       07602L
                          CALCIUM      MAGNESIUM    SODIUM       POTASSIUM    PHOSPHOROUS  PHOSPHORUS   NITROGEN     NITROGEN
                          DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED    TOTAL        TOTAL        TOTAL ORG.   TOTAL
                                                                              PHOSPHATE    PHOSPHATE    (CALCD.)     (CALCD.)
                   SUBM    CA           MG           NA           K            P            P            N            N
                    ID    MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)             9(0)         9(0)         9(0)         9(0)                      9(0)                      9(5)
           LOW              40.          10.          15.          2.0                      .052                      .720
          HIGH              98.          22.          71.          6.6                      .460                     2.580
       AVERAGE              63.         15.1         36.4          5.1                      .216                     1.580*
      STD.DEV.              16.          3.7         18.2          1.7                      .141                      .645*
  PERCNT:10TH
          25TH              54.          13.          21.          4.2                      .106                     Q1.150
 MEDIAN   50TH              62.          14.          30.          5.8                      .190                     Q1.550
          75TH              68.          18.          47.          6.3                      .320                     Q1.750
          90TH
SECONDARY CODE                                                                           21L

                          07021L       07503L       07562L       07205L       07206L       07105L       07906L       10407L
                          NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN     RESIDUE
                          TOTAL        TOTAL        DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED    PARTICULATE  NONFILTRABLE
                          KJELDAHL     AMMONIA      AMMONIA      NITRITE      NITRITE      NO3 & NO2    TOTAL
                   SUBM    N            N            N            N            N            N            N
                    ID    MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)             9(0)                      9(0)         9(9)                      9(5)         9(1)         9(0)
           LOW             .660                      .007         L.05                      L.05         L.01           5.
          HIGH            2.400                      .106         L.05                       .30          .61          54.
       AVERAGE            1.488                      .043                                   .092*        .218*         16.
      STD.DEV.             .587                      .036                                   .082*        .178*         15.
  PERCNT:10TH
          25TH            1.100                      .017         L.05                      L.05          .14          11.
 MEDIAN   50TH            1.500                      .028         L.05                      L.05          .19          12.
          75TH            1.700                      .070         L.05                       .10          .26          13.
          90TH
SECONDARY CODE

                          10474L       10453L       00205L       36001L       36011L       36102L       36910L       29009L
                          RESIDUE      RESIDUE      TOTAL        COLIFORMS    COLIFORMS    STREP.       STD. PLATE   COPPER
                          TOTAL        FILTRABLE    DISSOLVED    TOTAL        FECAL        FECAL        COUNT        TOTAL
                                                    SOLIDS                                              BACT.DENS.
                   SUBM                                          MPN          MPN          MF                        CU
                    ID    MG/L         MG/L         MG/L         NO/100ML     NO/100ML     NO/100ML     NO/ML        MG/L
SAMPLES(FLAGS)             9(0)         9(0)         9(0)         9(0)         9(2)         9(2)         9(0)         9(4)
           LOW             361.         350.         208.          10.          L2.          L2.         390.        L.001
          HIGH             652.         640.         539.         640.         170.         110.       14000.         .037
       AVERAGE             472.         457.         334.         248.         36.*         29.*        3151.         .008*
      STD.DEV.              91.          88.         100.         259.         57.*         41.*        4275.         .012*
  PERCNT:10TH
          25TH             403.         390.         259.          50.           4.           2.         880.        L.001
 MEDIAN   50TH             471.         460.         335.         130.          16.          10.        1800.         .002
          75TH             513.         490.         362.         490.          20.          20.        3000.         .003
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  30                   NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                   SURFACE WATER DATA
STATION 00AL05EB2505    LAT. 53D 50M 45S  LONG. 113D  1M 24S   PR 4   UTM 12 366900E 5968000N  FOR MAY 26, 1983 TO NOV 16, 1983
 REDWATER RIVER  -  MOUTH

                         30009L      26304L      13306L      25003L      28009L      42009L      27009L      33005L
                          ZINC        IRON      ALUMINUM   MANGANESE     NICKEL   MOLYBDENUM    COBALT     ARSENIC
                         TOTAL     EXTRBLE.    EXTRBLE.     TOTAL       TOTAL       TOTAL       TOTAL      TOTAL

                  SUBM     ZN          FE          AL          MN          NI          MO          CO          AS
                   ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            9(0)        9(0)        9(0)        9(0)        9(1)        8(8)        9(7)        7(0)
           LOW            .002         .11        .030        .029       L.001       L.001       L.001       .0006
          HIGH            .041        1.60        .320        .201        .018       L.001        .003       .0019
       AVERAGE            .010         .57        .091        .103        .008*                   .001*      .0012
      STD.DEV.            .012         .49        .089        .047        .006*                   .001*      .0005
  PERCNT:10TH
          25TH            .004         .24        .050        .078        .005       L.001       L.001       .0008
   MEDIAN 50TH            .007         .34        .055        .103        .007       L.001       L.001       .0010
          75TH            .008         .76        .095        .119        .007       L.001       L.001       .0017
          90TH
SECONDARY CODE

                         04304L      48009L      24009L      82302L      82009L      80015L      34005L      23009L
                        BERYLLIUM    CADMIUM    CHROMIUM      LEAD        LEAD      MERCURY    SELENIUM    VANADIUM
                         EXTRBLE.     TOTAL       TOTAL     EXTRBLE.     TOTAL       TOTAL      TOTAL       TOTAL

                  SUBM     BE          CD          CR          PB          PB          HG          SE          V
                   ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            9(9)        9(8)        9(3)        8(7)                    9(9)        7(7)        9(3)
           LOW           L.001       L.001       L.001       L.003                  L.0001      L.0002       L.002
          HIGH           L.001        .002        .004        .005                  L.0001      L.0002        .008
       AVERAGE                        .001*       .003*       .003*                                           .003*
      STD.DEV.                        .000*       .001*       .001*                                           .002*
  PERCNT:10TH
          25TH           L.001       L.001       L.001       L.003                  L.0001      L.0002       L.002
   MEDIAN 50TH           L.001       L.001        .003       L.003                  L.0001      L.0002        .003
          75TH           L.001       L.001        .003       L.003                  L.0001      L.0002        .004
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

NAQUADAT SUMMARY REPORT APR 30, 1986
SURFACE WATER DATA

STATION 00AL05EB2510 LAT. 53D 53M 23S LONG. 112D 56M 58S PR 3 UTM 12 371900E 5972800N FOR JUN 29, 1983 TO NOV 16, 1983
BEAVERHILL CREEK - NEAR MOUTH

	SUBM ID	97251F DEPTH OF SAMPLING FROM SURF. M	02065F TEMPERATURE WATER DEG.C	08102F OXYGEN DISSOLVED O2 MG/L	02042F SPECIFIC CONDUCT. USIE/CM	02041L SPECIFIC CONDUCT. US/CM	10301L PH PH UNITS	08202L OXYGEN BIOCHEM. DEMAND-BOD O2 MG/L	08301L OXYGEN TOTAL COD O2 MG/L
SAMPLES(FLAGS)		2(0)	6(0)	6(0)	6(0)	6(0)	6(0)	4(0)	6(0)
LOW		.9	2.0	5.6	310.	313.	7.5	1.1	21.9
HIGH		.9	21.0	12.4	720.	806.	8.2	6.7	121.2
AVERAGE		.9	13.9	7.9	558.	474.		2.9	59.1
STD.DEV.		.0	7.5	2.7	160.	174.		2.6	37.8
PERCNT:10TH									
25TH			7.5	6.2	430.	390.	8.0	1.4	26.7
MEDIAN 50TH		.9	17.0	6.7	595.	413.	8.0	1.9	54.5
75TH			19.	10.0	700.	510.	8.2	4.4	75.8
90TH									
SECONDARY CODE									04L

	SUBM ID	06536L PHENOLIC MATERIAL PHENOL MG/L	06005L CARBON TOTAL ORGANIC C MG/L	06154L CARBON DISSOLVED INORGANIC C MG/L	06107L CARBON DISSOLVED ORGANIC C MG/L	06905L CARBON PARTICULATE TOTAL C MG/L	06715L CHLORO - PHYLL A MG/M3	06721L CHLOROPHYLL -A- EPILITHON MG/M2	10151L ALKALINITY PHENOL PHTHALEIN CACO3 MG/L
SAMPLES(FLAGS)		6(0)		6(0)	6(0)	6(0)	6(0)		6(0)
LOW		.003		24.0	5.4	.39	2.32		.0
HIGH		.020		78.0	27.0	8.90	12.31		.0
AVERAGE		.012		46.8	16.7	2.22	7.39		.0
STD.DEV.		.007		18.0	8.8	3.34	4.37		.0
PERCNT:10TH									
25TH		.005		41.0	7.6	.49	3.01		.0
MEDIAN 50TH		.014		42.0	18.1	.70	7.24		.0
75TH		.017		54.0	24.0	2.13	12.21		.0
90TH									
SECONDARY CODE		37L							

	SUBM ID	10101L ALKALINITY TOTAL CACO3 MG/L	06301L CARBONATE (CALCD.) CO3 MG/L	06201L BICARBONT. (CALCD.) HCO3 MG/L	17203L CHLORIDE DISSOLVED CL MG/L	16306L SULPHATE DISSOLVED SO4 MG/L	09107L FLUORIDE DISSOLVED F MG/L	14102L SILICA REACTIVE SIO2 MG/L	10602L HARDNESS TOTAL (CALCD.) CACO3 MG/L
SAMPLES(FLAGS)		6(0)	6(0)	6(0)	6(0)	6(0)	6(0)	6(0)	6(0)
LOW		99.	0.	121.	3.	37.	.15	2.7	86.
HIGH		317.	0.	386.	12.	98.	.24	10.0	337.
AVERAGE		189.	0.	230.	5.3	51.	.19	6.8	184.
STD.DEV.		74.	0.	91.	3.5	23.	.03	3.1	83.
PERCNT:10TH									
25TH		162.	0.	197.	3.	40.	.17	3.2	153.
MEDIAN 50TH		166.	0.	202.	4.0	44.	.18	7.9	173.
75TH		224.	0.	273.	6.	45.	.20	8.8	182.
90TH									
SECONDARY CODE									

* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q

```
REQUEST 0004 -  0006 PAGE  32                    NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                        SURFACE WATER DATA
STATION 00AL05EB2510    LAT. 53D 53M 23S  LONG. 112D 56M 58S   PR 3   UTM 12 371900E 5972800N  FOR JUN 29, 1983 TO NOV 16, 1983
 BEAVERHILL CREEK -  NEAR MOUTH

                       20110L        12102L        11103L        19103L        15406L        15419L        07403L        07602L
                      CALCIUM      MAGNESIUM       SODIUM      POTASSIUM    PHOSPHOROUS   PHOSPHORUS     NITROGEN      NITROGEN
                     DISSOLVED     DISSOLVED     DISSOLVED     DISSOLVED       TOTAL         TOTAL      TOTAL ORG.       TOTAL
                                                                             PHOSPHATE     PHOSPHATE     (CALCD.)      (CALCD.)
               SUBM     CA            MG            NA            K             P             P             N             N
                ID     MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)         6(0)          6(0)          6(0)          6(0)                        6(0)                        6(1)
           LOW          23.            7.           11.           2.0                        .082                        .890
          HIGH          92.           26.           49.           8.2                        .330                       3.250
       AVERAGE          50.           14.5          26.7          5.3                        .209                       1.708*
      STD.DEV.          23.            6.3          13.9          2.5                        .107                        .921*
  PERCNT:10TH
          25TH          43.           11.           13.           2.8                        .108                       1.010
  MEDIAN  50TH          46.           14.0          27.5          6.0                        .216                       1.425
          75TH          48.           15.           32.           7.2                        .300                       2.250
          90TH
SECONDARY CODE                                                                       21L

                       07021L        07503L        07562L        07205L        07206L        07105L        07906L        10407L
                      NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN       RESIDUE
                       TOTAL         TOTAL       DISSOLVED     DISSOLVED     DISSOLVED     DISSOLVED    PARTICULATE  NONFILTRABLE
                      KJELDAHL      AMMONIA       AMMONIA       NITRITE       NITRITE      NO3 & NO2       TOTAL
               SUBM      N             N             N             N             N             N             N
                ID     MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)         6(0)                        6(0)          6(5)                        6(1)          6(1)          6(0)
           LOW          .740                        .020         L.05                        L.05          L.01            4.
          HIGH         3.100                        .980          .17                         .38           .84          418.
       AVERAGE         1.517                        .282          .070*                       .192*         .283*         88.
      STD.DEV.          .901                        .394          .049*                       .112*         .328*        163.
  PERCNT:10TH
          25TH          .840                        .026         L.05                         .15           .05           10.
  MEDIAN  50TH         1.210                        .067         L.050                        .160          .140          18.
          75TH         2.000                        .530         L.05                         .25           .52           57.
          90TH
SECONDARY CODE

                       10474L        10453L        00205L        36001L        36011L        36102L        36910L        29009L
                      RESIDUE       RESIDUE        TOTAL       COLIFORMS     COLIFORMS      STREP.     STD. PLATE      COPPER
                       TOTAL       FILTRABLE     DISSOLVED       TOTAL         FECAL         FECAL         COUNT         TOTAL
                                                  SOLIDS                                              BACT.DENS.
               SUBM                                              MPN           MPN           MF                          CU
                ID     MG/L          MG/L          MG/L        NO/100ML      NO/100ML      NO/100ML       NO/ML         MG/L
SAMPLES(FLAGS)         6(0)          6(0)          6(0)          6(0)          6(1)          6(1)          6(0)          6(1)
           LOW          304.          240.          170.           14.            2.            2.         1200.         L.001
          HIGH          658.          540.          473.         7000.          110.          150.        25000.          .019
       AVERAGE          438.          350.          267.         1661.           49.*          48.*        6483.          .008*
      STD.DEV.          140.          102.          108.         2698.           43.*          57.*        9218.          .007*
  PERCNT:10TH
          25TH          330.          300.          211.          100.          L20.           12.         1500.          .002
  MEDIAN  50TH          387.          325.          231.          525.           35.           21.*        2900.          .006
          75TH          559.          370.          286.         1800.           92.           80.         5400.          .016
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  33                      NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                         SURFACE WATER DATA
STATION 00AL05EB2510    LAT. 53D 53M 23S  LONG. 112D 56M 58S   PR 3   UTM 12 371900E 5972800N  FOR JUN 29, 1983 TO NOV 16, 1983
 BEAVERHILL CREEK -  NEAR MOUTH

                        30009L      26304L      13306L      25003L      28009L      42009L       27009L      33005L
                         ZINC        IRON      ALUMINUM   MANGANESE     NICKEL    MOLYBDENUM     COBALT      ARSENIC
                        TOTAL      EXTRBLE.    EXTRBLE.     TOTAL       TOTAL       TOTAL        TOTAL      TOTAL

                 SUBM    ZN          FE          AL          MN          NI          MO           CO          AS
                  ID    MG/L        MG/L        MG/L        MG/L        MG/L        MG/L         MG/L        MG/L
SAMPLES(FLAGS)          6(0)        6(0)        6(0)        6(0)        6(0)        6(3)         6(2)        4(0)
           LOW          .005         .21        .060        .042        .008       L.001        L.001       .0008
          HIGH          .055        7.32       8.450        .284        .022        .006         .006       .0035
       AVERAGE          .017        2.23       1.532        .131        .012        .003*        .003*      .0018
      STD.DEV.          .019        2.67       3.391        .094        .005        .002*        .002*      .0012
   PERCNT:10TH
          25TH          .005         .32        .070        .062        .009       L.001        L.001       .0010
   MEDIAN 50TH          .010        1.47        .115        .098        .010        .002*        .002       .0015
          75TH          .017        2.61        .385        .205        .012        .004         .003       .0026
          90TH
SECONDARY CODE

                        04304L      48009L      24009L      82302L      82009L      80015L       34005L      23009L
                       BERYLLIUM    CADMIUM    CHROMIUM      LEAD        LEAD       MERCURY     SELENIUM    VANADIUM
                       EXTRBLE.     TOTAL       TOTAL      EXTRBLE.     TOTAL       TOTAL       TOTAL        TOTAL

                 SUBM    BE          CD          CR          PB          PB          HG           SE          V
                  ID    MG/L        MG/L        MG/L        MG/L        MG/L        MG/L         MG/L        MG/L
SAMPLES(FLAGS)          6(6)        6(5)        6(0)        5(3)                    6(6)         4(4)        6(2)
           LOW         L.001       L.001        .003       L.003                  L.0001       L.0002       L.002
          HIGH         L.001        .002        .008        .031                  L.0001       L.0002        .022
       AVERAGE                      .001*       .005        .010*                                            .008*
      STD.DEV.                      .000*       .002        .012*                                            .008*
   PERCNT:10TH
          25TH         L.001       L.001        .003       L.003                  L.0001       L.0002       L.002
   MEDIAN 50TH         L.001       L.001        .004       L.003                  L.0001       L.0002        .007
          75TH         L.001       L.001        .005        .012                  L.0001       L.0002        .009
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  34                NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                 SURFACE WATER DATA
STATION 00AL05EB2521    LAT. 53D 56M  2S  LONG. 113D 54M 17S   PR 3   UTM 12 309350E 5979850N  FOR MAY 18, 1982 TO MAR 01, 1984
 NORTH SASKATCHEWAN RIVER    LEFT BANK     DOWNSTREAM OF CONFLUENCE WITH
 BEAVERHILLS CREEK

                       97251F       02065F       08102F       02042F       02041L       10301L       08202L       08301L
                      DEPTH OF    TEMPERATURE    OXYGEN      SPECIFIC     SPECIFIC        PH         OXYGEN       OXYGEN
                      SAMPLING       WATER      DISSOLVED    CONDUCT.     CONDUCT.                   BIOCHEM.    TOTAL COD
                                                                                                   DEMAND-BOD
                 SUBM FROM SURF.                   O2                                                  O2           O2
                  ID      M         DEG.C         MG/L      USIE/CM       US/CM       PH UNITS        MG/L         MG/L
SAMPLES(FLAGS)          16(0)       22(0)        22(0)       21(0)        22(0)        23(0)         20(1)        23(0)
           LOW             .3          .0          5.7        320.         280.          7.2            .8          5.1
          HIGH            1.8        23.5         14.4        450.         420.          8.5           7.5         62.0
       AVERAGE            1.0        14.4         10.4        386.         356.                        2.4*         19.0
      STD.DEV.             .5         7.3          2.5         38.          35.                        1.6*         14.0
  PERCNT:10TH              .5          .6          7.7        345.         325.          7.8            .9*          7.1
          25TH             .6         9.5          8.7        370.         338.          7.9           1.2           9.
   MEDIAN 50TH            1.0        17.0          9.4        380.         354.          8.1           2.0          15.
          75TH            1.4        19.5         13.         425.         377.          8.3           3.0          24.
          90TH            1.8        20.5         13.8        440.         412.          8.5           4.1          37.
SECONDARY CODE                                                                                                  04L

                       06536L       06005L       06154L       06107L       06905L       06715L       06721L       10151L
                      PHENOLIC      CARBON       CARBON       CARBON       CARBON      CHLORO -    CHLOROPHYLL  ALKALINITY
                      MATERIAL      TOTAL       DISSOLVED    DISSOLVED   PARTICULATE   PHYLL A        -A-         PHENOL
                       PHENOL      ORGANIC      INORGANIC     ORGANIC      TOTAL                   EPILITHON    PHTHALEIN
                 SUBM                 C            C            C            C                                   CACO3
                  ID    MG/L        MG/L         MG/L         MG/L         MG/L          MG/M3        MG/M2        MG/L
SAMPLES(FLAGS)         23(16)       11(0)        15(0)        15(0)        15(0)        10(0)         9(0)        21(4)
           LOW          L.002         6.3         29.0          1.1          .04         3.15        18.828          .0
          HIGH           .006        14.          38.9         11.0        13.13        17.38       210.67           5.
       AVERAGE           .003*        9.8         34.3          4.6         2.09         8.56        74.454          1.2*
      STD.DEV.           .001*        2.9          3.3          3.5         3.29         5.31        58.910          2.0*
  PERCNT:10TH           L.002         6.7         30.0          1.3          .19         3.85                        .0
          25TH          L.002         7.          31.0          2.1          .34         4.56        35.91           0.
   MEDIAN 50TH          L.002         9.3         34.0          2.7         1.12         6.41        50.401          .0
          75TH           .003        12.5         38.           8.1         2.49        11.77        87.269         L4.2
          90TH           .005        14.          38.8         11.0         4.65        17.38                      L4.2
SECONDARY CODE          37L

                       10101L       06301L       06201L       17203L       16306L       09107L       14102L       10602L
                     ALKALINITY   CARBONATE    BICARBONT.    CHLORIDE     SULPHATE     FLUORIDE      SILICA      HARDNESS
                        TOTAL      (CALCD.)      (CALCD.)    DISSOLVED    DISSOLVED    DISSOLVED    REACTIVE       TOTAL
                                                                                                                 (CALCD.)
                 SUBM   CACO3        CO3         HCO3            CL        SO4           F            SIO2         CACO3
                  ID    MG/L         MG/L        MG/L           MG/L       MG/L         MG/L          MG/L         MG/L
SAMPLES(FLAGS)          23(0)        21(4)         21(4)        23(5)      23(0)        23(0)         23(0)        23(0)
           LOW           117.           0.          143.         L0.         20.          .12           1.1         119.
          HIGH           155.           6.          185.          8.         60.          .52           6.7         177.
       AVERAGE           137.           1.*         165.*        3.0*        40.          .18           3.6         154.
      STD.DEV.            10.           2.*          13.*        1.8*        10.          .08           1.5          15.
  PERCNT:10TH            126.           0.         Q146.         L0.         25.          .14           1.5         136.
          25TH           130.           0.          157.          2.         35.          .14           2.9         144.
   MEDIAN 50TH           137.           0.          166.          3.         40.          .15           3.2         155.
          75TH           144.          Q5.          176.          5.         45.          .17           4.1         165.
          90TH           152.          Q5.          179.          5.         55.          .23           5.5         167.
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  35                          NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                           SURFACE WATER DATA
STATION 00AL05EB2521    LAT. 53D 56M  2S  LONG. 113D 54M 17S   PR 3   UTM 12 309350E 5979850N  FOR MAY 18, 1982 TO MAR 01, 1984
 NORTH SASKATCHEWAN RIVER     LEFT BANK     DOWNSTREAM OF CONFLUENCE WITH
 BEAVERHILLS CREEK

                          20110L      12102L      11103L      19103L      15406L      15419L      07403L      07602L
                          CALCIUM    MAGNESIUM    SODIUM    POTASSIUM  PHOSPHOROUS  PHOSPHORUS   NITROGEN    NITROGEN
                         DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED    TOTAL       TOTAL     TOTAL ORG.    TOTAL
                                                                        PHOSPHATE   PHOSPHATE   (CALCD.)    (CALCD.)
                  SUBM       CA          MG          NA          K           P           P           N           N
                   ID       MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)             23(0)       23(0)       23(0)       23(0)        9(0)       11(0)       12(12)      23(12)
           LOW               34.          7.          3.          .7        .015        .050       Q.100       Q.350
          HIGH               51.        13.0         17.         3.9        .155        .310       Q.500       1.740
       AVERAGE               43.        11.3         9.2         1.6        .097        .156                    .770*
      STD.DEV.                4.         1.4         3.3          .8        .045        .101                    .403*
   PERCNT:10TH               37.         10.          5.          .9                    .056       Q.100        .470
          25TH               40.         10.          7.         1.1        .070        .066        .100        .540
   MEDIAN 50TH               44.         11.          9.         1.4          .1        .116        .100       Q.550
          75TH               46.        12.0         11.         1.6        .135        .280        .200       Q.950
          90TH               48.         13.         13.         3.0                    .290       Q.400       1.620
SECONDARY CODE                                                                        21L

                          07021L      07503L      07562L      07205L      07206L      07105L      07906L      10407L
                         NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN     RESIDUE
                          TOTAL       TOTAL     DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED  PARTICULATE NONFILTRABLE
                         KJELDAHL    AMMONIA     AMMONIA     NITRITE     NITRITE    NO3 & NO2     TOTAL
                  SUBM       N           N           N           N           N           N           N
                   ID      MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)             23(8)      12(12)       11(0)      23(22)       12(2)      23(10)       15(3)       16(0)
           LOW              .300         L.4        .034        L.05       L.007        L.05        L.01          4.
          HIGH             1.400         L.4       1.100         .13        .025         .56         .19        143.
       AVERAGE              .627*                   .255        .053*       .013*       .143*       .093*        22.
      STD.DEV.              .298*                   .316        .017*       .006*       .130*       .059*        35.
   PERCNT:10TH              .360         L.4        .047        L.05       L.007        L.05        L.01          5.
          25TH              .440        L.40        .066        L.05        .007        L.05         .06          8.
   MEDIAN 50TH               L.5        L.40        .140        L.05        .012         .10         .08          9.
          75TH                .8        L.40        .270        L.05        .018         .18         .15         18.
          90TH             1.180         L.4        .540       L.050         .02        .270         .18         59.
SECONDARY CODE            01L

                          10474L      10453L      00205L      36001L      36011L      36102L      36910L      29009L
                          RESIDUE     RESIDUE      TOTAL     COLIFORMS   COLIFORMS    STREP.    STD. PLATE    COPPER
                           TOTAL    FILTRABLE    DISSOLVED     TOTAL       FECAL       FECAL      COUNT        TOTAL
                                                  SOLIDS                                        BACT.DENS.
                  SUBM                                         MPN         MPN          MF                      CU
                   ID      MG/L        MG/L        MG/L      NO/100ML    NO/100ML    NO/100ML     NO/ML        MG/L
SAMPLES(FLAGS)             16(0)       16(0)       23(0)       21(0)       21(0)       21(1)       19(0)       23(7)
           LOW              247.        240.        141.        170.         20.          2.         70.       L.001
          HIGH              423.        350.        236.      24000.        980.        450.      14000.        .020
       AVERAGE              306.        278.        191.       3653.        288.         85.*      2871.        .003*
      STD.DEV.               52.         37.         22.       5037.        299.        123.*      4107.        .004*
   PERCNT:10TH              249.        240.        166.        700.         40.          8.        170.       L.001
          25TH              262.        245.        178.       1200.         76.         14.        830.       L.001
   MEDIAN 50TH              298.        270.        192.       2600.        150.         30.       1100.        .002
          75TH              353.        300.        203.       4000.        450.         90.       3200.        .003
          90TH              362.        340.        226.       6200.        750.        290.      14000.        .004
SECONDARY CODE                                            02L         12L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  36                        NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                         SURFACE WATER DATA
STATION 00AL05EB2521    LAT. 53D 56M  2S  LONG. 113D 54M 17S   PR 3   UTM 12 309350E 5979850N  FOR MAY 18, 1982 TO MAR 01, 1984
 NORTH SASKATCHEWAN RIVER     LEFT BANK     DOWNSTREAM OF CONFLUENCE WITH
 BEAVERHILLS CREEK
                          30009L       26304L       13306L       25003L       28009L       42009L       27009L       33005L
                           ZINC         IRON       ALUMINUM     MANGANESE     NICKEL     MOLYBDENUM     COBALT      ARSENIC
                          TOTAL       EXTRBLE.     EXTRBLE.      TOTAL        TOTAL        TOTAL        TOTAL       TOTAL

                  SUBM     ZN           FE           AL           MN           NI           MO           CO           AS
                   ID     MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)            23(1)        23(0)        19(0)        20(0)        23(1)        17(16)       23(22)       15(1)
           LOW             L.001         .06         .030         .009        L.001        L.001        L.001        L.0002
          HIGH              .046        2.28        4.440         .106         .009         .004         .003         .0023
       AVERAGE              .016*        .41         .520         .028         .005*        .001*        .001*        .0007*
      STD.DEV.              .013*        .56        1.017         .028         .002*        .001*        .000*        .0007*
   PERCNT:10TH              .003         .06         .050         .010         .004        L.001        L.001         .0003
          25TH              .004         .10         .080         .012         .004        L.001        L.001         .0003
    MEDIAN 50TH             .010         .17         .140         .014         .005        L.001        L.001         .0005
          75TH              .028         .55         .406         .040         .006        L.001        L.001         .0007
          90TH              .034        1.08        1.430         .073         .007        L.001        L.001         .0023
SECONDARY CODE
                          04304L       48009L       24009L       82302L       82009L       80015L       34005L       23009L
                         BERYLLIUM    CADMIUM      CHROMIUM       LEAD         LEAD        MERCURY     SELENIUM     VANADIUM
                          EXTRBLE.     TOTAL        TOTAL        EXTRBLE.     TOTAL        TOTAL       TOTAL        TOTAL

                  SUBM     BE           CD           CR           PB           PB           HG           SE           V
                   ID     MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)            19(19)       23(20)       23(6)        9(6)         12(8)        11(11)       15(13)       19(7)
           LOW             L.001        L.001        L.001        L.003        L.003        L.0001       L.0002       L.002
          HIGH             L.001         .002         .010         .007         .010        L.0001        .0006        .013
       AVERAGE                           .001*        .004*        .004*        .004*                     .0002*       .004*
      STD.DEV.                           .000*        .003*        .001*        .002*                     .0001*       .003*
   PERCNT:10TH             L.001        L.001        L.001                     L.003        L.0001       L.0002       L.002
          25TH             L.001        L.001        L.001        L.003        L.003        L.0001       L.0002       L.002
    MEDIAN 50TH            L.001        L.001         .004        L.003        L.003        L.0001       L.0002        .003
          75TH             L.001        L.001         .006         .004         .005        L.0001       L.0002        .006
          90TH             L.001         .002         .007                      .005        L.0001        .0003        .008
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  37                  NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                     SURFACE WATER DATA
STATION 00AL05EB2522    LAT. 53D 55M 58S  LONG. 113D 54M 14S   PR 3   UTM 12 309350E 5979750N  FOR MAY 18, 1982 TO NOV 16, 1983
 NORTH SASKATCHEWAN RIVER          CENTRE      DOWNSTREAM OF CONFLUENCE WITH
 BEAVERHILLS CREEK

                            97251F        02065F        08102F        02042F        02041L        10301L        08202L        08301L
                           DEPTH OF    TEMPERATURE      OXYGEN       SPECIFIC      SPECIFIC         PH          OXYGEN        OXYGEN
                           SAMPLING       WATER       DISSOLVED      CONDUCT.      CONDUCT.                    BIOCHEM.     TOTAL COD
                                                                                                              DEMAND-BOD
                  SUBM    FROM SURF.                      02                                                      02            02
                   ID           M         DEG.C          MG/L        USIE/CM        US/CM       PH UNITS         MG/L          MG/L
    SAMPLES(FLAGS)             15(0)         20(0)         20(0)         19(0)         21(0)         21(0)         18(2)         21(0)
               LOW                .3            .5           5.7          305.          279.           7.0           L.3           5.1
              HIGH               3.4          23.5          14.4          450.          407.           8.5           5.1          58.4
           AVERAGE               2.2          15.7           9.2          371.          344.                        2.1*          17.2
          STD.DEV.                .8           5.9           2.1           42.           30.                        1.3*          11.7
       PERCNT:10TH                .9           6.1           7.5          310.          316.           7.7            .9           6.5
              25TH               1.8          15.3           8.0          340.          330.           7.9          L1.0           10.
       MEDIAN 50TH               2.1          17.5           8.5          375.          340.           8.1           2.1           15.
              75TH               2.7          19.5          10.6          400.          362.           8.3            3.           19.
              90TH               3.4          20.8          12.2          435.          372.           8.4           4.0           28.
    SECONDARY CODE                                                                                                             04L

                            06536L        06005L        06154L        06107L        06905L        06715L        06721L        10151L
                           PHENOLIC       CARBON        CARBON        CARBON        CARBON       CHLORO -    CHLOROPHYLL    ALKALINITY
                           MATERIAL       TOTAL       DISSOLVED     DISSOLVED    PARTICULATE    PHYLL A         -A-          PHENOL
                            PHENOL       ORGANIC      INORGANIC      ORGANIC        TOTAL                    EPILITHON     PHTHALEIN
                  SUBM                      C             C             C             C                                    CACO3
                   ID        MG/L          MG/L          MG/L          MG/L          MG/L         MG/M3         MG/M2         MG/L
    SAMPLES(FLAGS)            21(15)         11(0)          9(0)          9(0)          9(1)          9(0)                       21(4)
               LOW             L.002            6.          28.0           1.1          L.01          2.29                          .0
              HIGH              .005           13.          38.0           7.5          5.68         15.00                        L4.2
           AVERAGE             .002*           9.4          32.3           4.1         1.88*          6.16                         .8*
          STD.DEV.             .001*           2.4           3.4           2.7         2.01*          3.92                        1.7*
       PERCNT:10TH             L.002           7.1                                                                                .0
              25TH             L.002           7.2          29.0           1.7           .36          3.33                          0.
       MEDIAN 50TH             L.002           8.6          33.0           3.1           .81          5.91                          .0
              75TH              .002           11.          34.0           6.4          3.51          7.66                          .0
              90TH              .003           13.                                                                              L4.2
    SECONDARY CODE         37L

                            10101L        06301L        06201L        17203L        16306L        09107L        14102L        10602L
                          ALKALINITY    CARBONATE     BICARBONT.     CHLORIDE      SULPHATE      FLUORIDE       SILICA       HARDNESS
                            TOTAL        (CALCD.)      (CALCD.)     DISSOLVED     DISSOLVED     DISSOLVED      REACTIVE        TOTAL
                                                                                                                            (CALCD.)
                  SUBM      CACO3          CO3          HCO3           CL           SO4            F           SIO2         CACO3
                   ID        MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
    SAMPLES(FLAGS)             21(0)         21(4)         21(4)         21(4)         21(0)         21(0)         21(0)         21(0)
               LOW              118.            0.          144.           L0.           20.           .12           1.6          114.
              HIGH              152.           Q5.          184.            8.           55.           .59           5.9          172.
           AVERAGE              134.           1.*         162.*          2.6*           38.           .18           3.7          150.
          STD.DEV.               10.           2.*          11.*          1.6*           11.           .10           1.2           15.
       PERCNT:10TH              125.            0.         Q146.           L0.           20.           .14           1.8          138.
              25TH              127.            0.          154.            2.           35.           .14           3.2          143.
       MEDIAN 50TH              134.            0.          161.            2.           40.           .15           3.7          154.
              75TH              140.            0.          171.            3.           43.           .16           4.1          159.
              90TH              150.           Q5.         Q175.            4.           48.           .24           5.2          167.
    SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,6 OR Q
```

```
                                                NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                     SURFACE WATER DATA
STATION 00AL05EB2522    LAT. 53D 55M 58S  LONG. 113D 54M 14S   PR 3   UTM 12 309350E 5979750N  FOR MAY 18, 1982 TO NOV 16, 1983
 NORTH SASKATCHEWAN RIVER       CENTRE     DOWNSTREAM OF CONFLUENCE WITH
 BEAVERHILLS CREEK

                         20110L      12102L      11103L      19103L      15406L      15419L      07403L      07602L
                         CALCIUM    MAGNESIUM    SODIUM    POTASSIUM  PHOSPHOROUS  PHOSPHORUS   NITROGEN    NITROGEN
                        DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED     TOTAL       TOTAL    TOTAL ORG.    TOTAL
                                                                        PHOSPHATE   PHOSPHATE   (CALCD.)    (CALCD.)
                  SUBM      CA          MG          NA          K           P           P           N           N
                   ID      MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            21(0)       21(0)       21(0)       21(0)        9(0)       15(0)      12(12)       21(9)
           LOW              34.          7.          3.          .7        .015        .066      Q-.100      Q.310
          HIGH              49.         13.         14.         2.2        .228        .860      Q.300       3.050
       AVERAGE              41.         11.4         7.6        1.3        .118        .179                   .878*
      STD.DEV.               4.          1.4         2.5         .4        .057        .196                   .588*
  PERCNT:10TH               37.         10.          5.          .9                    .083      Q.100       Q.550
          25TH              40.         11.          6.         1.0        .100        .094       .100        .600
   MEDIAN 50TH              42.         12.          8.         1.1        .106        .122       .100       Q.700
          75TH              43.         12.          9.         1.5        .137        .150       .150        .910
          90TH              47.         13.         10.         1.9                    .280      Q.200       1.400
SECONDARY CODE                                                                      21L

                         07021L      07503L      07562L      07205L      07206L      07105L      07906L      10407L
                        NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN     RESIDUE
                          TOTAL       TOTAL     DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED  PARTICULATE NONFILTRABLE
                        KJELDAHL    AMMONIA     AMMONIA     NITRITE     NITRITE    NO3 & NO2     TOTAL
                  SUBM      N           N           N           N           N           N           N
                   ID      MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            21(3)       12(11)      15(0)       21(16)      12(1)       21(5)        9(3)       14(0)
           LOW             .260        L.4         .004        L.05       L.007        L.05        L.01          5.
          HIGH            2.900         .6        2.060         .13        .042         .60         .20        205.
       AVERAGE             .666*        .42*       .275        .059*       .020*       .185*       .077*        41.
      STD.DEV.             .547*        .06*       .503        .020*       .010*       .148*       .072*        60.
  PERCNT:10TH              .390        L.4         .024        L.05        .007        L.05                      8.
          25TH             .470        L.40        .088        L.05        .012         .08        L.01          9.
   MEDIAN 50TH             .5          L.40        .130        L.05        .019         .15         .07         12.
          75TH             .630        L.40        .240        L.05        .026         .20         .13         48.
          90TH             .900        L.4         .340         .08        .031         .35                    142.
SECONDARY CODE            01L
                         10474L      10453L      00205L      36001L      36011L      36102L      36910L      29009L
                         RESIDUE     RESIDUE      TOTAL     COLIFORMS   COLIFORMS    STREP.    STD. PLATE    COPPER
                          TOTAL    FILTRABLE   DISSOLVED     TOTAL       FECAL       FECAL       COUNT       TOTAL
                                                 SOLIDS                                       BACT.DENS.
                  SUBM                                        MPN         MPN          MF                    CU
                   ID      MG/L        MG/L        MG/L     NO/100ML    NO/100ML    NO/100ML     NO/ML       MG/L
SAMPLES(FLAGS)            14(0)       14(0)       21(0)       21(0)       21(0)       21(3)       19(0)       21(7)
           LOW             210.        200.        140.        370.         20.         L2.        210.       L.001
          HIGH             415.        350.        225.      24000.       5700.        520.      26000.        .012
       AVERAGE             302.        261.        183.       6468.       1041.        133.*      4739.        .003*
      STD.DEV.              58.         40.         20.       6691.       1597.        153.*      7265.        .003*
  PERCNT:10TH              231.        210.        161.        970.         72.          6.        600.       L.001
          25TH             269.        240.        169.       1500.        170.         24.       1000.       L.001
   MEDIAN 50TH             291.        265.        189.       4100.        400.         70.       1900.        .003
          75TH             358.        280.        194.       9000.       1100.        200.       5000.        .005
          90TH             382.        310.        204.      13000.       2600.        360.      21000.        .006
SECONDARY CODE                                            02L         12L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
                                                       SURFACE WATER DATA
STATION 00AL05EB2522     LAT. 53D 55M 58S  LONG. 113D 54M 14S   PR 3   UTM 12 309350E 5979750N  FOR MAY 18, 1982 TO NOV 16, 1983
 NORTH SASKATCHEWAN RIVER        CENTRE     DOWNSTREAM OF CONFLUENCE WITH
 BEAVERHILLS CREEK

                          30009L      26304L      13306L      25003L      28009L      42009L      27009L      33005L
                           ZINC        IRON      ALUMINUM   MANGANESE     NICKEL    MOLYBDENUM    COBALT      ARSENIC
                          TOTAL      EXTRBLE.    EXTRBLE.     TOTAL       TOTAL       TOTAL       TOTAL      TOTAL

                  SUBM      ZN          FE          AL          MN          NI          MO          CO          AS
                   ID      MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            21(1)       21(1)       17(0)       18(3)       21(3)       16(15)      21(19)      13(2)
           LOW             L.001       L.02        .050        L.008       L.001       L.001       L.001       L.0002
          HIGH             .053        2.34        4.530       .122        .031        .005        .003        .0025
       AVERAGE             .020*       .43*        .718        .032*       .007*       .001*       .001*       .0007*
      STD.DEV.             .015*       .54*        1.174       .031*       .007*       .001*       .001*       .0006*
   PERCNT:10TH             .004        .09         .075        L.008       L.001       L.001       L.001       L.0002
          25TH             .006        .12         .145        .011        .003        L.001       L.001       .0003
   MEDIAN 50TH             .014        .18         .257        .017        .006        L.001       L.001       .0005
          75TH             .030        .63         .515        .045        .008        L.001       L.001       .0009
          90TH             .038        .87         2.560       .088        .011        L.001       L.001       .0014
SECONDARY CODE

                          04304L      48009L      24009L      82302L      82009L      80015L      34005L      23009L
                         BERYLLIUM    CADMIUM    CHROMIUM      LEAD        LEAD       MERCURY    SELENIUM    VANADIUM
                          EXTRBLE.    TOTAL       TOTAL      EXTRBLE.     TOTAL       TOTAL      TOTAL        TOTAL

                  SUBM      BE          CD          CR          PB          PB          HG          SE          V
                   ID      MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            17(17)      21(19)      21(4)       7(2)        12(10)      9(9)        13(12)      17(7)
           LOW             L.001       L.001       L.001       L.003       L.003       L.0001      L.0002      L.002
          HIGH             L.001       .003        .023        .006        .006        L.0001      .0003       .013
       AVERAGE                         .001*       .005*       .004*       .003*                   .0002*      .004*
      STD.DEV.                         .000*       .005*       .001*       .001*                   .0000*      .003*
   PERCNT:10TH             L.001       L.001       L.001                   L.003                   L.0002      L.002
          25TH             L.001       L.001       .004        L.003       L.003       L.0001      L.0002      L.002
   MEDIAN 50TH             L.001       L.001       .005        .004        L.003       L.0001      L.0002      .003
          75TH             L.001       L.001       .006        .006        L.003       L.0001      L.0002      .006
          90TH             L.001       L.001       .008                    .005                    L.0002      .008
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  40                 NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                   SURFACE WATER DATA
STATION 00AL05EB2523    LAT. 53D 55M 56S  LONG. 113D 54M 11S   PR 3   UTM 12 309450E 5979650N  FOR MAY 18, 1982 TO MAR 01, 1984
 NORTH SASKATCHEWAN RIVER   RIGHT BANK     DOWNSTREAM OF CONFLUENCE WITH
 BEAVERHILLS CREEK

                        97251F       02065F       08102F       02042F       02041L       10301L       08202L       08301L
                       DEPTH OF    TEMPERATURE    OXYGEN      SPECIFIC     SPECIFIC        PH         OXYGEN       OXYGEN
                       SAMPLING       WATER      DISSOLVED    CONDUCT.     CONDUCT.                  BIOCHEM.     TOTAL COD
                                                                                                    DEMAND-BOD
                 SUBM  FROM SURF.                   02                                                 02           02
                  ID       M          DEG.C        MG/L       USIE/CM       US/CM       PH UNITS      MG/L         MG/L
SAMPLES(FLAGS)           16(0)        21(0)        21(0)       20(0)        23(0)        23(0)        20(1)        23(1)
           LOW              .3           .5          5.3        310.         281.          6.8           .9         L5.0
          HIGH             2.7         23.0         13.0        470.         424.          8.4          6.5         62.9
       AVERAGE             1.7         14.1          9.4        383.         354.                       2.6*        16.8*
      STD.DEV.              .8          7.2          2.3         41.          32.                       1.6*        13.0*
   PERCNT:10TH              .3          1.5          7.         320.         319.          7.4          1.0*         6.9
          25TH             1.0          9.0          7.5        360.         336.          7.7          1.2          7.3
   MEDIAN 50TH             2.1         16.5          9.4        378.         357.          8.0          2.2          13.
          75TH             2.1         19.5         11.6        415.         370.          8.2          3.6          22.
          90TH             2.7         20.          12.4        433.         382.          8.3          5.0          28.
SECONDARY CODE                                                                                                   04L

                        06536L       06005L       06154L       06107L       06905L       06715L       06721L       10151L
                       PHENOLIC      CARBON       CARBON       CARBON       CARBON     CHLORO -    CHLOROPHYLL   ALKALINITY
                       MATERIAL      TOTAL      DISSOLVED    DISSOLVED   PARTICULATE   PHYLL A         -A-         PHENOL
                        PHENOL      ORGANIC     INORGANIC     ORGANIC       TOTAL                  EPILITHON    PHTHALEIN
                 SUBM                  C            C            C            C                                 CACO3
                  ID     MG/L         MG/L         MG/L         MG/L         MG/L        MG/M3        MG/M2        MG/L
SAMPLES(FLAGS)          23(16)        11(0)        15(0)        15(0)        15(1)         9(0)         9(0)       21(2)
           LOW            L.002          7.         29.0           .9         L.01         2.63        6.018          .0
          HIGH             .004        13.4         39.0          7.7         6.69        19.26       238.91         L4.2
       AVERAGE             .002*        8.9         34.3          3.5         1.46*        6.23      107.471          .4*
      STD.DEV.             .001*        1.7          3.2          2.5         1.75*        5.02       80.225         1.3*
   PERCNT:10TH            L.002         7.1         29.0           .9          .33                                  .0
          25TH            L.002         8.          32.0          1.3          .40         4.13       29.716         0.
   MEDIAN 50TH            L.002         8.6         34.0          2.6         1.00         4.51       107.06         0.
          75TH             .003         9.          37.0          6.2         1.78         5.38       139.67          .0
          90TH             .003        10.          38.4          7.1         3.90                                  .0
SECONDARY CODE           37L

                        10101L       06301L       06201L       17203L       16306L       09107L       14102L       10602L
                      ALKALINITY   CARBONATE    BICARBONT.    CHLORIDE     SULPHATE     FLUORIDE      SILICA      HARDNESS
                         TOTAL      (CALCD.)      (CALCD.)    DISSOLVED    DISSOLVED    DISSOLVED    REACTIVE       TOTAL
                                                                                                                (CALCD.)
                 SUBM    CACO3         CO3         HCO3          CL           SO4           F          SIO2         CACO3
                  ID     MG/L         MG/L        MG/L          MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)           23(0)        21(2)        21(2)        23(2)        23(0)        23(0)        23(0)        23(0)
           LOW            117.           0.        Q142.          L0.          20.          .12          1.8         120.
          HIGH            155.          Q5.         189.          10.          63.         1.15          6.4         177.
       AVERAGE            133.           0.*        162.*         3.2*         39.          .21          3.7         153.
      STD.DEV.             10.           2.*         13.*         1.9*         10.          .21          1.2          14.
   PERCNT:10TH            122.           0.         145.          2.           25.          .14          1.8         135.
          25TH            125.           0.         154.          2.           35.          .15          3.1         141.
   MEDIAN 50TH            133.           0.         163.          3.           40.          .15          3.5         157.
          75TH            139.           0.         169.          4.           45.          .17          4.1         163.
          90TH            149.           0.         178.          5.           50.          .22          5.5         173.
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  41                  NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                      SURFACE WATER DATA
STATION 00AL05EB2523    LAT. 53D 55M 56S  LONG. 113D 54M 11S   PR 3   UTM 12 309450E 5979650N  FOR MAY 18, 1982 TO MAR 01, 1984
 NORTH SASKATCHEWAN RIVER   RIGHT BANK     DOWNSTREAM OF CONFLUENCE WITH
 BEAVERHILLS CREEK

                            20110L        12102L        11103L        19103L        15406L        15419L        07403L        07602L
                           CALCIUM      MAGNESIUM       SODIUM      POTASSIUM    PHOSPHOROUS    PHOSPHORUS     NITROGEN      NITROGEN
                          DISSOLVED     DISSOLVED     DISSOLVED     DISSOLVED       TOTAL         TOTAL      TOTAL ORG.       TOTAL
                                                                               PHOSPHATE     PHOSPHATE      (CALCD.)      (CALCD.)
                     SUBM     CA            MG            NA            K             P             P             N             N
                      ID     MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)              23(0)         23(0)         23(0)         23(0)          9(0)         11(0)         12(10)        23(4)
           LOW                35.            8.            3.            .7          .023          .060         Q.100          .370
          HIGH                51.           14.           13.           2.7          .182         1.650         1.700         5.570
       AVERAGE                42.          11.5           8.2           1.2          .125          .286          .375*        1.397*
      STD.DEV.                 4.           1.3           2.4            .5          .046          .462          .469*        1.136*
  PERCNT:10TH                 37.           10.            6.            .9                        .072         Q.100          .610
          25TH                40.           11.            7.           1.0          .109          .078          .100         Q.750
   MEDIAN 50TH                43.           12.            8.           1.0          .126          .104          .200          .950
          75TH                44.           12.           10.           1.2          .154          .240          .400         1.950
          90TH                48.           13.           11.           2.0                        .380         Q.800         2.420
SECONDARY CODE                                                                                   21L

                            07021L        07503L        07562L        07205L        07206L        07105L        07906L        10407L
                           NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN      RESIDUE
                            TOTAL         TOTAL       DISSOLVED     DISSOLVED     DISSOLVED     DISSOLVED    PARTICULATE  NONFILTRABLE
                           KJELDAHL      AMMONIA       AMMONIA       NITRITE       NITRITE     NO3 & NO2       TOTAL
                     SUBM      N             N             N             N             N             N             N
                      ID     MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)              23(2)         12(10)        11(0)         23(14)        12(1)         23(2)         15(2)         16(0)
           LOW               .260           L.4          .034           L.05         L.007          L.05          L.01            6.
          HIGH              5.300            .5         4.000            .28          .059           .90          1.00          251.
       AVERAGE              1.031*          .42*         .718           .089*         .031*         .366*         .169*          33.
      STD.DEV.              1.050*          .04*        1.138           .067*         .016*         .251*         .266*          60.
  PERCNT:10TH                .420           L.4          .140           L.05          .014           .11          L.01            7.
          25TH                 .5          L.40          .150           L.05          .019          .150          .040           11.
   MEDIAN 50TH                 .7          L.40          .240           L.05          .030           .27           .08           14.
          75TH                1.2          L.40          .720            .12          .041           .54           .11           25.
          90TH              1.720            .5         1.160            .20          .054          .820           .56           58.
SECONDARY CODE              01L

                            10474L        10453L        00205L        36001L        36011L        36102L        36910L        29009L
                           RESIDUE       RESIDUE        TOTAL       COLIFORMS     COLIFORMS      STREP.      STD. PLATE      COPPER
                            TOTAL       FILTRABLE     DISSOLVED       TOTAL         FECAL         FECAL         COUNT         TOTAL
                                                       SOLIDS                                               BACT.DENS.
                     SUBM                                              MPN           MPN            MF                          CU
                      ID     MG/L          MG/L          MG/L       NO/100ML      NO/100ML      NO/100ML        NO/ML         MG/L
SAMPLES(FLAGS)              16(0)         16(0)         23(0)         21(0)         21(0)         21(0)         19(0)         23(3)
           LOW               218.          210.          140.          350.           30.            2.           50.         L.001
          HIGH               461.          350.          223.        50000.        16000.          700.        27000.          .019
       AVERAGE               304.          271.          187.         6163.         1156.          139.         4994.          .004*
      STD.DEV.                57.           39.           19.        11404.         3421.          187.         7333.          .004*
  PERCNT:10TH                241.          210.          160.          500.           80.            8.          530.         L.001
          25TH               270.          250.          174.         1100.          120.           20.         1200.          .002
   MEDIAN 50TH               305.          270.          190.         2400.          250.           90.         2000.          .003
          75TH               320.          295.          199.         4700.          900.          140.         5600.          .005
          90TH               379.          310.          205.         9200.         1000.          300.        22000.          .006
SECONDARY CODE                                                    02L           12L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  42                    NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                         SURFACE WATER DATA
STATION 00AL05EB2523    LAT. 53D 55M 56S  LONG. 113D 54M 11S   PR 3   UTM 12 309450E 5979650N  FOR MAY 18, 1982 TO MAR 01, 1984
 NORTH SASKATCHEWAN RIVER    RIGHT BANK      DOWNSTREAM OF CONFLUENCE WITH
 BEAVERHILLS CREEK

                          30009L      26304L      13306L      25003L      28009L      42009L      27009L      33005L
                           ZINC        IRON      ALUMINUM    MANGANESE    NICKEL    MOLYBDENUM    COBALT     ARSENIC
                          TOTAL      EXTRBLE.    EXTRBLE.     TOTAL       TOTAL       TOTAL       TOTAL      TOTAL

                  SUBM      ZN          FE          AL          MN          NI          MO          CO          AS
                   ID      MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            23(0)       23(0)       19(0)       20(0)       23(1)       18(13)      23(20)      15(2)
           LOW              .003         .03        .040        .009       L.001       L.001       L.001      L.0002
          HIGH              .051        2.72       5.140        .119        .085        .006        .007       .0025
       AVERAGE              .021         .44        .545        .030        .012*       .002*       .001*      .0008*
      STD.DEV.              .017         .64       1.141        .030        .017*       .002*       .001*      .0007*
  PERCNT:10TH               .005         .06        .045        .010        .004       L.001       L.001      L.0002
          25TH              .007         .10        .100        .012        .005       L.001       L.001       .0004
   MEDIAN 50TH              .013         .16        .180        .016        .007       L.001       L.001       .0005
          75TH              .036         .55        .489        .044        .010        .004       L.001       .0007
          90TH              .048         .93       1.010        .075        .022        .004        .003       .0024
SECONDARY CODE

                          04304L      48009L      24009L      82302L      82009L      80015L      34005L      23009L
                        BERYLLIUM    CADMIUM     CHROMIUM      LEAD        LEAD      MERCURY     SELENIUM    VANADIUM
                         EXTRBLE.     TOTAL       TOTAL      EXTRBLE.     TOTAL       TOTAL      TOTAL        TOTAL

                  SUBM      BE          CD          CR          PB          PB          HG          SE          V
                   ID      MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            19(19)      23(21)      23(1)        9(4)       12(7)       10(10)      15(13)      19(5)
           LOW             L.001       L.001       L.001       L.003       L.003      L.0001      L.0002       L.002
          HIGH             L.001        .003        .008        .009        .007      L.0001       .0005        .014
       AVERAGE                          .001*       .005*       .005*       .004*                  .0002*       .004*
      STD.DEV.                          .000*       .002*       .002*       .001*                  .0001*       .003*
  PERCNT:10TH              L.001       L.001        .003                   L.003      L.0001      L.0002       L.002
          25TH             L.001       L.001        .003       L.003       L.003      L.0001      L.0002       L.002
   MEDIAN 50TH             L.001       L.001        .005        .004       L.003      L.0001      L.0002        .003
          75TH             L.001       L.001        .008        .006        .005      L.0001      L.0002        .006
          90TH             L.001       L.001        .008                    .006      L.0001       .0003        .012
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

NAQUADAT SUMMARY REPORT APR 30, 1986
SURFACE WATER DATA

STATION 00AL05EC2301 LAT. 53D 59M 30S LONG. 112D 28M 47S PR 3 UTM 12 403000E 5983400N FOR MAY 19, 1982 TO MAR 01, 1984
NORTH SASKATCHEWAN RIVER LEFT BANK ABOVE PAKAN BRIDGE 90M UPSTREAM

	97251F DEPTH OF SAMPLING	02065F TEMPERATURE WATER	08102F OXYGEN DISSOLVED	02042F SPECIFIC CONDUCT.	02041L SPECIFIC CONDUCT.	10301L PH	08202L OXYGEN BIOCHEM. DEMAND-BOD	08301L OXYGEN TOTAL COD
SUBM ID	FROM SURF. M	DEG.C	02 MG/L	USIE/CM	US/CM	PH UNITS	02 MG/L	02 MG/L
SAMPLES(FLAGS)	16(0)	21(0)	21(0)	20(0)	23(0)	23(0)	19(3)	23(0)
LOW	.3	.2	5.8	280.	279.	7.3	.5	5.6
HIGH	2.4	23.2	14.8	430.	410.	8.7	5.9	27.
AVERAGE	1.3	14.0	9.9	366.	349.		2.1*	14.7
STD.DEV.	.6	7.4	2.3	38.	29.		1.3*	6.5
PERCNT:10TH	.3	.5	7.6	315.	315.	7.7	.9	6.9
25TH	.9	8.0	8.6	345.	328.	7.8	L1.0	8.
MEDIAN 50TH	1.5	16.5	9.4	360.	352.	8.0	2.0	15.
75TH	1.7	19.5	10.8	393.	364.	8.3	2.8	20.
90TH	2.1	20.	13.	413.	389.	8.4	3.9	22.7
SECONDARY CODE								04L

	06536L PHENOLIC MATERIAL PHENOL	06005L CARBON TOTAL ORGANIC	06154L CARBON DISSOLVED INORGANIC	06107L CARBON DISSOLVED ORGANIC	06905L CARBON PARTICULATE TOTAL	06715L CHLORO - PHYLL A	06721L CHLOROPHYLL -A- EPILITHON	10151L ALKALINITY PHENOL PHTHALEIN
SUBM ID	MG/L	C MG/L	C MG/L	C MG/L	C MG/L	MG/M3	MG/M2	CACO3 MG/L
SAMPLES(FLAGS)	22(16)	11(0)	15(0)	15(0)	15(1)	9(0)	9(0)	21(4)
LOW	L.002	6.	28.0	.7	L.01	2.56	19.604	.0
HIGH	.005	13.	37.	9.6	5.25	29.28	290.74	10.
AVERAGE	.002*	9.6	33.1	3.4	1.39*	9.56	123.164	1.6*
STD.DEV.	.001*	1.8	2.3	2.5	1.37*	7.95	105.624	2.9*
PERCNT:10TH	L.002	8.4	31.0	.8	.45			.0
25TH	L.002	8.7	31.9	1.6	.52	5.55	32.54	0.
MEDIAN 50TH	L.002	9.3	33.0	2.8	.95	8.20	85.135	.0
75TH	.002	10.	35.0	4.1	1.66	10.41	203.40	L4.2
90TH	.004	12.0	36.0	6.9	3.57			L4.2
SECONDARY CODE	37L							

	10101L ALKALINITY TOTAL	06301L CARBONATE (CALCD.)	06201L BICARBONT. (CALCD.)	17203L CHLORIDE DISSOLVED	16306L SULPHATE DISSOLVED	09107L FLUORIDE DISSOLVED	14102L SILICA REACTIVE	10602L HARDNESS TOTAL (CALCD.)
SUBM ID	CACO3 MG/L	CO3 MG/L	HCO3 MG/L	CL MG/L	SO4 MG/L	F MG/L	SIO2 MG/L	CACO3 MG/L
SAMPLES(FLAGS)	23(0)	21(4)	21(4)	23(5)	23(0)	23(0)	23(0)	23(0)
LOW	117.	0.	143.	L0.	20.	.12	.6	119.
HIGH	158.	12.	177.	10.	60.	.45	13.5	177.
AVERAGE	134.	2.*	160.*	3.0*	40.	.18	3.5	151.
STD.DEV.	10.	4.*	10.*	2.0*	10.	.08	2.6	14.
PERCNT:10TH	119.	0.	145.	L0.	25.	.13	1.0	135.
25TH	127.	0.	154.	2.	38.	.14	2.5	141.
MEDIAN 50TH	134.	0.	162.	3.	40.	.15	3.0	150.
75TH	139.	Q5.	167.	4.	44.	.17	4.0	159.
90TH	147.	Q5.	169.	5.	50.	.22	5.2	171.
SECONDARY CODE								

* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q

```
REQUEST 0004 -  0006 PAGE  44                    NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                        SURFACE WATER DATA
STATION 00AL05EC2301    LAT. 53D 59M 30S  LONG. 112D 28M 47S   PR 3   UTM 12 403000E 5983400N  FOR MAY 19, 1982 TO MAR 01, 1984
 NORTH SASKATCHEWAN RIVER     LEFT BANK     ABOVE PAKAN BRIDGE 90M UPSTREAM

                         20110L      12102L      11103L      19103L      15406L      15419L      07403L      07602L
                        CALCIUM    MAGNESIUM     SODIUM    POTASSIUM  PHOSPHOROUS  PHOSPHORUS   NITROGEN    NITROGEN
                       DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED     TOTAL       TOTAL     TOTAL ORG.     TOTAL
                                                                      PHOSPHATE   PHOSPHATE    (CALCD.)    (CALCD.)
                 SUBM      CA          MG          NA          K           P           P           N           N
                  ID      MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
  SAMPLES(FLAGS)            23(0)       23(0)       23(0)       23(0)       10(0)       11(0)      12(11)      23(11)
             LOW              34.          5.          3.          .7        .032        .068       Q.100       Q.410
            HIGH              51.         14.         13.         2.3        .176        .560       Q.300       2.620
         AVERAGE              42.        11.1         8.0         1.3        .102        .201        .133*       .885*
        STD.DEV.               4.         2.0         2.8          .5        .042        .163        .065*       .539*
     PERCNT:10TH              36.         10.          4.          .9        .045        .076       Q.100       Q.550
            25TH              40.         10.          6.         1.0        .084        .084        .100       Q.550
     MEDIAN 50TH              42.         12.          8.         1.2        .097        .122        .100       Q.750
            75TH              44.        12.0         10.         1.3        .129        .300        .150       1.000
            90TH              47.         13.         12.         2.0        .157        .440        .200       1.620
  SECONDARY CODE                                                                       21L

                         07021L      07503L      07562L      07205L      07206L      07105L      07906L      10407L
                        NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN     RESIDUE
                         TOTAL       TOTAL     DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED  PARTICULATE NONFILTRABLE
                        KJELDAHL    AMMONIA     AMMONIA     NITRITE     NITRITE    NO3 & NO2     TOTAL
                 SUBM      N           N           N           N           N           N           N
                  ID      MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
  SAMPLES(FLAGS)            23(6)      12(11)       11(1)      23(19)       12(3)       23(7)       15(2)       16(0)
             LOW             .300         L.4       L.002        L.05       L.007        L.05        L.01          3.
            HIGH            2.060          .4       1.660        .100        .032        .560         .34        164.
         AVERAGE             .681*        .40*       .389*       .054*       .017*       .204*       .117*        25.
        STD.DEV.             .422*        .00*       .587*       .011*       .009*       .154*       .096*        39.
     PERCNT:10TH             .360         L.4        .014        L.05       L.007        L.05        L.01          5.
            25TH              L.5        L.40        .040        L.05        .008*       L.05        .040          8.
     MEDIAN 50TH               .5        L.40        .072        L.05        .016         .20         .10         12.
            75TH             .700        L.40        .540        L.05        .027         .27         .19         21.
            90TH            1.100         L.4       1.400        .060        .027         .40        .270         51.
  SECONDARY CODE         01L

                         10474L      10453L      00205L      36001L      36011L      36102L      36910L      29009L
                        RESIDUE     RESIDUE      TOTAL     COLIFORMS   COLIFORMS     STREP.    STD. PLATE    COPPER
                         TOTAL     FILTRABLE   DISSOLVED     TOTAL       FECAL       FECAL       COUNT       TOTAL
                                                 SOLIDS                                        BACT.DENS.
                 SUBM                                          MPN         MPN          MF                     CU
                  ID      MG/L        MG/L        MG/L      NO/100ML    NO/100ML    NO/100ML     NO/ML        MG/L
  SAMPLES(FLAGS)            16(0)       16(0)       23(0)       20(0)       20(1)       20(4)       17(0)       23(6)
             LOW             229.        220.        139.         76.        L10.         L1.         90.       L.001
            HIGH             424.        340.        222.     320000.       9100.        550.      65000.        .007
         AVERAGE             299.        274.        187.      20706.        641.*        90.*      6978.        .003*
        STD.DEV.              49.         36.         19.      70904.       2010.*       143.*     16824.        .002*
     PERCNT:10TH             249.        240.        158.        110.         10.         L2.        280.       L.001
            25TH             260.        245.        178.        350.         20.          3.        810.       L.001
     MEDIAN 50TH             300.        270.        187.       1400.        105.         45.       1200.        .003
            75TH             321.        295.        199.       9000.        300.        100.       2400.        .004
            90TH             353.        330.        211.      24000.        850.        305.      33000.        .005
  SECONDARY CODE                                                 02L         12L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  45                      NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                       SURFACE WATER DATA
STATION 00AL05EC2301    LAT. 53D 59M 30S  LONG. 112D 28M 47S   PR 3   UTM 12 403000E 5983400N  FOR MAY 19, 1982 TO MAR 01, 1984
 NORTH SASKATCHEWAN RIVER     LEFT BANK      ABOVE PAKAN BRIDGE 90M UPSTREAM

                          30009L      26304L      13306L      25003L      28009L      42009L      27009L      33005L
                           ZINC        IRON      ALUMINUM   MANGANESE     NICKEL   MOLYBDENUM    COBALT     ARSENIC
                          TOTAL     EXTRBLE.    EXTRBLE.     TOTAL       TOTAL       TOTAL       TOTAL      TOTAL

                   SUBM     ZN          FE          AL          MN          NI          MO          CO          AS
                    ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)             23(0)       23(0)       19(1)       20(1)       23(1)       18(18)      23(22)      15(2)
           LOW              .003         .02       L.020       L.008       L.001       L.001       L.001      L.0002
          HIGH              .041        2.36       4.410        .117        .026       L.001        .002        .004
       AVERAGE              .019         .38        .550*       .028*       .007*                   .001*      .0008*
      STD.DEV.              .015         .57       1.016*       .029*       .005*                   .000*      .0009*
  PERCNT:10TH               .003         .05        .050        .010        .004       L.001       L.001      L.0002
          25TH              .004         .09        .080        .011        .005       L.001       L.001       .0004
   MEDIAN 50TH              .013         .18        .138        .015        .006       L.001       L.001       .0005
          75TH              .035         .45        .546        .036        .007       L.001       L.001       .0008
          90TH              .039         .61       1.580        .071        .012       L.001       L.001       .0015
SECONDARY CODE

                          04304L      48009L      24009L      82302L      82009L      80015L      34005L      23009L
                         BERYLLIUM    CADMIUM    CHROMIUM      LEAD        LEAD      MERCURY    SELENIUM    VANADIUM
                          EXTRBLE.     TOTAL       TOTAL     EXTRBLE.      TOTAL       TOTAL     TOTAL        TOTAL

                   SUBM     BE          CD          CR          PB          PB          HG          SE          V
                    ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)             19(19)      23(20)      23(3)        7(4)       12(7)       11(11)      15(13)      19(8)
           LOW             L.001       L.001       L.001       L.003       L.003      L.0001      L.0002       L.002
          HIGH             L.001        .004        .009        .007        .008      L.0001       .0004        .012
       AVERAGE                          .001*       .005*       .004*       .004*                  .0002*       .004*
      STD.DEV.                          .001*       .002*       .002*       .002*                  .0001*       .003*
  PERCNT:10TH              L.001       L.001       L.001                   L.003      L.0001      L.0002       L.002
          25TH             L.001       L.001        .003       L.003       L.003      L.0001      L.0002       L.002
   MEDIAN 50TH             L.001       L.001        .004       L.003       L.003      L.0001      L.0002        .003
          75TH             L.001       L.001        .006        .005        .005      L.0001      L.0002        .006
          90TH             L.001        .002        .008                    .007      L.0001       .0003        .007
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  46                        NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                           SURFACE WATER DATA
STATION 00AL05EC2302    LAT. 53D 59M 26S  LONG. 112D 28M 47S   PR 3   UTM 12 403000E 5983250N  FOR MAY 19, 1982 TO NOV 16, 1983
 NORTH SASKATCHEWAN RIVER        CENTRE     ABOVE PAKAN BRIDGE   -    90M UPSTREAM

                            97251F        02065F        08102F        02042F        02041L        10301L        08202L        08301L
                           DEPTH OF    TEMPERATURE      OXYGEN       SPECIFIC      SPECIFIC         PH          OXYGEN        OXYGEN
                           SAMPLING       WATER       DISSOLVED      CONDUCT.      CONDUCT.                    BIOCHEM.     TOTAL COD
                                                                                                              DEMAND-BOD
                  SUBM    FROM SURF.                      02                                                      02            02
                   ID         M           DEG.C          MG/L        USIE/CM        US/CM        PH UNITS        MG/L          MG/L
SAMPLES(FLAGS)                14(0)         19(0)         19(0)         18(0)         21(0)         21(0)         17(1)         20(0)
           LOW                   .0            .4           5.6          300.          279.           7.3            .3           6.1
          HIGH                  2.7          23.5          14.4          440.          410.           8.7           5.4          69.2
       AVERAGE                  1.6          15.7           9.2          372.          345.                         2.0*         18.0
      STD.DEV.                   .7           6.2           2.3           38.           30.                         1.3*         13.9
   PERCNT:10TH                   .9            4.           5.8          300.          309.           7.6            .4           7.7
          25TH                  1.2          15.2           7.9          350.          327.           7.9            1.           9.9
   MEDIAN 50TH                  1.5          17.2           8.4          373.          343.           8.2           2.1          15.1
          75TH                  1.8          19.5           11.          400.          363.           8.3           2.3          20.0
          90TH                  2.5          21.5          12.4          430.          372.           8.4           3.7          29.5
SECONDARY CODE                                                                                                                  04L

                            06536L        06005L        06154L        06107L        06905L        06715L        06721L        10151L
                           PHENOLIC       CARBON        CARBON        CARBON        CARBON       CHLORO -    CHLOROPHYLL    ALKALINITY
                           MATERIAL       TOTAL       DISSOLVED     DISSOLVED    PARTICULATE     PHYLL A         -A-          PHENOL
                            PHENOL       ORGANIC      INORGANIC      ORGANIC        TOTAL                     EPILITHON     PHTHALEIN
                  SUBM                      C             C             C             C                                     CACO3
                   ID        MG/L          MG/L          MG/L          MG/L          MG/L         MG/M3         MG/M2          MG/L
SAMPLES(FLAGS)               20(12)         10(0)          9(0)          9(0)          9(1)          9(0)          1(0)         21(2)
           LOW                L.002           5.5          29.0            .7          L.01          2.77        10.961            .0
          HIGH                 .013           11.          36.0           8.5          5.06         29.21        10.961           9.2
       AVERAGE                 .003*          8.7          32.4           3.9          1.38*        10.13                       1.1*
      STD.DEV.                 .003*          2.0           2.5           2.5          1.47*         7.99                       2.5*
   PERCNT:10TH                L.002           5.8                                                                              .0
          25TH                L.002           7.5          31.0           2.0           .81          5.91                        0.
   MEDIAN 50TH                L.002           9.0          32.0           3.4          1.10          7.47                        .0
          75TH                 .004           10.          35.0           5.5          1.18         11.54                        .0
          90TH                 .005          11.0                                                                              L4.2
SECONDARY CODE              37L

                            10101L        06301L        06201L        17203L        16306L        09107L        14102L        10602L
                          ALKALINITY    CARBONATE     BICARBONT.     CHLORIDE      SULPHATE      FLUORIDE       SILICA       HARDNESS
                            TOTAL        (CALCD.)      (CALCD.)     DISSOLVED     DISSOLVED     DISSOLVED      REACTIVE        TOTAL
                                                                                                                          (CALCD.)
                  SUBM       CACO3          CO3          HCO3            CL           SO4             F          SIO2         CACO3
                   ID        MG/L          MG/L         MG/L           MG/L          MG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)                21(0)         21(2)         21(2)         21(6)         21(0)         21(0)         21(1)         21(0)
           LOW                 116.            0.          141.           L0.           20.           .12           L.5          114.
          HIGH                 157.           11.          178.           11.           60.           .58           6.0          171.
       AVERAGE                 134.            1.*         160.*          2.8*          37.           .17           3.2*         149.
      STD.DEV.                  10.            3.*          11.*          2.3*          11.           .10           1.5*          15.
   PERCNT:10TH                 122.            0.          146.           L0.           20.           .13           1.1          133.
          25TH                 127.            0.          152.           L0.           30.           .15           2.7          141.
   MEDIAN 50TH                 133.            0.          161.            2.           40.           .15           3.2          149.
          75TH                 138.            0.          167.            4.           42.           .16           4.0          159.
          90TH                 146.           Q5.          176.            4.           50.           .19           5.3          168.
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  47                        NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                         SURFACE WATER DATA
STATION 00AL05EC2302    LAT. 53D 59M 26S  LONG. 112D 28M 47S   PR 3   UTM 12 403000E 5983250N  FOR MAY 19, 1982 TO NOV 16, 1983
 NORTH SASKATCHEWAN RIVER        CENTRE     ABOVE PAKAN BRIDGE   -   90M UPSTREAM

                             20110L      12102L      11103L      19103L      15406L      15419L      07403L      07602L
                             CALCIUM     MAGNESIUM   SODIUM      POTASSIUM   PHOSPHOROUS PHOSPHORUS  NITROGEN    NITROGEN
                             DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED   TOTAL       TOTAL       TOTAL ORG.  TOTAL
                                                                             PHOSPHATE   PHOSPHATE   (CALCD.)    (CALCD.)
                    SUBM     CA          MG          NA          K           P           P           N           N
                     ID      MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)               21(0)       21(0)       21(0)       21(0)       10(0)       14(0)       11(11)      20(8)
           LOW                  34.          7.          3.          .8        .024        .076      Q.100       Q.410
          HIGH                  48.         14.         13.         2.5        .250        .960      Q.400       3.850
       AVERAGE                  41.        11.2         7.8         1.3        .117        .188                   .961*
      STD.DEV.                   4.         1.5         2.9          .5        .062        .230                   .766*
  PERCNT:10TH                   35.         10.          4.          .9        .045        .078      Q.100        .525
          25TH                  40.         10.          6.         1.0        .079        .097      Q.100        .560
   MEDIAN 50TH                  41.         11.          7.         1.2        .105        .114      Q.100        .680
          75TH                  44.         12.          9.         1.6        .153        .149      Q.300        .955
          90TH                  47.         13.         12.         2.0        .204        .320      Q.300       1.640
SECONDARY CODE                                                                         21L

                             07021L      07503L      07562L      07205L      07206L      07105L      07906L      10407L
                             NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    RESIDUE
                             TOTAL       TOTAL       DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED   PARTICULATE NONFILTRABLE
                             KJELDAHL    AMMONIA     AMMONIA     NITRITE     NITRITE     NO3 & NO2   TOTAL
                    SUBM     N           N           N           N           N           N           N
                     ID      MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)               20(4)       11(11)      14(1)       21(17)      11(1)       21(5)       9(3)        14(0)
           LOW                 .320        L.4       L.002        L.05       L.007        L.05        L.01          7.
          HIGH                3.400        L.4       2.500         .10        .036         .65         .54        161.
       AVERAGE                 .713*                  .299*       .056*       .018*       .229*       .160*        31.
      STD.DEV.                 .673*                  .642*       .013*       .010*       .160*       .170*        40.
  PERCNT:10TH                  .355        L.4        .010        L.05        .008        L.05                      8.
          25TH                 .400        L.4        .042        L.05        .009         .07        L.01          9.
   MEDIAN 50TH                L.500        L.4        .125        L.05        .014         .20         .13         16.
          75TH                 .665        L.4        .200        L.05        .030         .32         .21         35.
          90TH                1.140        L.4        .320         .07        .031         .45                     58.
SECONDARY CODE               01L

                             10474L      10453L      00205L      36001L      36011L      36102L      36910L      29009L
                             RESIDUE     RESIDUE     TOTAL       COLIFORMS   COLIFORMS   STREP.      STD. PLATE  COPPER
                             TOTAL       FILTRABLE   DISSOLVED   TOTAL       FECAL       FECAL       COUNT       TOTAL
                                                     SOLIDS                                          BACT.DENS.
                    SUBM                                         MPN         MPN         MF                      CU
                     ID      MG/L        MG/L        MG/L        NO/100ML    NO/100ML    NO/100ML    NO/ML       MG/L
SAMPLES(FLAGS)               14(0)       14(0)       21(0)       19(0)       19(2)       20(3)       18(0)       21(5)
           LOW                 207.        200.        137.         52.         L2.         L1.         50.      L.001
          HIGH                 391.        340.        219.      25000.       8700.       4400.      35000.       .016
       AVERAGE                 297.        266.        183.       3641.       605.*       300.*      4059.        .004*
      STD.DEV.                  47.         41.         20.       6314.      1970.*       988.*      8068.        .004*
  PERCNT:10TH                  264.        230.        158.        140.          2.         L2.         60.      L.001
          25TH                 266.        240.        175.        330.         14.          6.        960.       .002
   MEDIAN 50TH                 288.        255.        182.       1100.         96.         39.       1650.       .002
          75TH                 328.        280.        193.       2800.        280.         48.       4000.       .005
          90TH                 357.        330.        208.      14000.        820.        555.       9700.       .008
SECONDARY CODE                                                   02L         12L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  48                     NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                       SURFACE WATER DATA
STATION 00AL05EC2302    LAT. 53D 59M 26S  LONG. 112D 28M 47S   PR 3   UTM 12 403000E 5983250N  FOR MAY 19, 1982 TO NOV 16, 1983
 NORTH SASKATCHEWAN RIVER       CENTRE     ABOVE PAKAN BRIDGE   -   90M UPSTREAM

                      30009L      26304L      13306L      25003L      28009L      42009L      27009L      33005L
                       ZINC        IRON      ALUMINUM   MANGANESE     NICKEL    MOLYBDENUM    COBALT     ARSENIC
                      TOTAL     EXTRBLE.    EXTRBLE.      TOTAL       TOTAL       TOTAL       TOTAL      TOTAL

                SUBM    ZN          FE          AL          MN          NI          MO          CO          AS
                 ID    MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)        21(1)       21(1)       17(0)       18(2)       21(0)       17(14)      21(21)      13(2)
           LOW         L.001        L.02        .035       L.008        .003       L.001       L.001      L.0002
          HIGH          .057        2.56       4.740        .108        .039        .005       L.001       .0020
       AVERAGE          .018*        .50*       .597        .030*       .009        .002*                  .0007*
      STD.DEV.          .016*        .68*      1.130        .029*       .008        .001*                  .0005*
   PERCNT:10TH          .004         .06        .065       L.008        .004       L.001       L.001      L.0002
          25TH          .006         .11        .100        .012        .005       L.001       L.001       .0004
   MEDIAN 50TH          .016         .25        .202        .018        .007       L.001       L.001       .0005
          75TH          .025         .58        .381        .045        .009       L.001       L.001       .0008
          90TH          .044         .87       1.450        .088        .021        .004       L.001       .0012
SECONDARY CODE

                      04304L      48009L      24009L      82302L      82009L      80015L      34005L      23009L
                     BERYLLIUM    CADMIUM    CHROMIUM      LEAD        LEAD      MERCURY    SELENIUM    VANADIUM
                      EXTRBLE.     TOTAL       TOTAL     EXTRBLE.      TOTAL       TOTAL     TOTAL        TOTAL

                SUBM    BE          CD          CR          PB          PB          HG          SE          V
                 ID    MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)        17(17)      21(18)      21(3)       6(1)        12(8)        9(9)       12(10)      17(6)
           LOW         L.001       L.001       L.001       L.003       L.003      L.0001      L.0002       L.002
          HIGH         L.001        .003        .010        .008        .008      L.0001       .0004        .013
       AVERAGE                      .001*       .005*       .006*       .004*                  .0002*       .004*
      STD.DEV.                      .001*       .003*       .002*       .001*                  .0001*       .003*
   PERCNT:10TH         L.001       L.001       L.001                   L.003                  L.0002       L.002
          25TH         L.001       L.001        .004        .005       L.003      L.0001      L.0002       L.002
   MEDIAN 50TH         L.001       L.001        .005        .006       L.003      L.0001      L.0002        .003
          75TH         L.001       L.001        .007        .008        .004      L.0001      L.0002        .006
          90TH         L.001        .002        .009                    .005                   .0003        .008
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  49                       NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                         SURFACE WATER DATA
STATION 00AL05EC2303    LAT. 53D 59M 22S  LONG. 112D 28M 47S   PR 3   UTM 12 403000E 5983150N  FOR MAY 19, 1982 TO MAR 01, 1984
 NORTH SASKATCHEWAN RIVER   RIGHT BANK     ABOVE PAKAN BRIDGE        90M UPSTREAM

                      97251F      02065F      08102F      02042F      02041L      10301L      08202L      08301L
                     DEPTH OF   TEMPERATURE   OXYGEN     SPECIFIC    SPECIFIC       PH        OXYGEN      OXYGEN
                     SAMPLING      WATER     DISSOLVED   CONDUCT.    CONDUCT.                BIOCHEM.    TOTAL COD
                                                                                            DEMAND-BOD
               SUBM  FROM SURF.                 02                                              02          02
                ID      M         DEG.C        MG/L      USIE/CM      US/CM     PH UNITS       MG/L        MG/L
SAMPLES(FLAGS)        16(0)       20(0)       20(0)       19(0)       23(0)       23(0)       19(2)       23(0)
           LOW           .3          .5         5.6        310.        275.         7.2         L.3         6.1
          HIGH          2.7        23.5        14.2        440.        419.         8.7         5.6        97.3
       AVERAGE          1.4        14.7         9.4        372.        347.                     2.1*       18.2
      STD.DEV.           .7         6.8         2.2         34.         30.                     1.4*       19.3
  PERCNT:10TH            .3         2.3         7.2        310.        311.         7.7          .5         7.3
          25TH          1.0        11.5         8.0        350.        331.         7.9        L1.0         7.8
   MEDIAN 50TH          1.6        16.8         9.0        370.        349.         8.1         1.8        12.4
          75TH          1.8        19.5        10.8        400.        361.         8.2         3.0        19.
          90TH          2.1        20.8        12.4        425.        374.         8.4         4.1        28.
SECONDARY CODE                                                                                          04L

                      06536L      06005L      06154L      06107L      06905L      06715L      06721L      10151L
                     PHENOLIC     CARBON      CARBON      CARBON      CARBON     CHLORO -  CHLOROPHYLL  ALKALINITY
                     MATERIAL     TOTAL      DISSOLVED   DISSOLVED  PARTICULATE  PHYLL A       -A-        PHENOL
                      PHENOL     ORGANIC    INORGANIC    ORGANIC      TOTAL                 EPILITHON   PHTHALEIN
               SUBM                  C           C           C           C                               CACO3
                ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/M3       MG/M2       MG/L
SAMPLES(FLAGS)        22(15)      11(0)       14(0)       14(0)       15(1)        9(0)        9(0)       21(2)
           LOW        L.002          7.        28.0          .9        L.01        2.18       10.96          .0
          HIGH        L.02          11.        37.          8.3        3.64       22.26      280.09         9.2
       AVERAGE         .003*        9.0        32.9         3.3        1.29*       8.14       96.164        1.2*
      STD.DEV.         .004*        1.4         3.0         2.2        1.10*       6.20       85.316        2.6*
  PERCNT:10TH         L.002          7.        28.0         1.1         .19                                 .0
          25TH        L.002         7.6        31.0         1.5         .56        5.14       29.197        0.
   MEDIAN 50TH        L.002         9.2        33.5         2.9        1.06        6.35       78.754         .0
          75TH         .003         10.        35.2         3.8        1.91        8.71      131.15          .0
          90TH         .004        10.1        36.0         7.1        3.54                                L4.2
SECONDARY CODE        37L

                      10101L      06301L      06201L      17203L      16306L      09107L      14102L      10602L
                    ALKALINITY  CARBONATE   BICARBONT.   CHLORIDE    SULPHATE    FLUORIDE     SILICA     HARDNESS
                      TOTAL      (CALCD.)    (CALCD.)   DISSOLVED   DISSOLVED   DISSOLVED    REACTIVE     TOTAL
                                                                                                         (CALCD.)
               SUBM   CACO3        CO3        HCO3          CL         SO4          F          SIO2       CACO3
                ID     MG/L        MG/L       MG/L         MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)        23(0)       21(2)       21(2)       23(3)       23(0)       23(0)       23(1)       23(0)
           LOW         115.          0.        140.         L0.         20.         .12         L.5        116.
          HIGH         158.         11.        178.         11.         58.         .74         6.0        172.
       AVERAGE         133.          1.*       161.*        3.0*        39.         .19         3.3*       151.
      STD.DEV.          10.          3.*        11.*        2.2*        10.         .14         1.5*        14.
  PERCNT:10TH          120.          0.        145.         L0.         30.         .14         1.1        134.
          25TH         127.          0.        154.          2.         30.         .15         2.6        141.
   MEDIAN 50TH         134.          0.        163.          2.         40.         .15         3.2        155.
          75TH         138.          0.        167.          4.         44.         .16         4.0        161.
          90TH         146.         Q5.        174.          5.         50.         .18         5.3        168.
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  50                    NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                     SURFACE WATER DATA
STATION 00AL05EC2303    LAT. 53D 59M 22S  LONG. 112D 28M 47S   PR 3   UTM 12 403000E 5983150N  FOR MAY 19, 1982 TO MAR 01, 1984
 NORTH SASKATCHEWAN RIVER    RIGHT BANK     ABOVE PAKAN BRIDGE        90M UPSTREAM

                             20110L       12102L       11103L       19103L       15406L       15419L       07403L       07602L
                             CALCIUM      MAGNESIUM    SODIUM       POTASSIUM    PHOSPHOROUS  PHOSPHORUS   NITROGEN     NITROGEN
                             DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED    TOTAL        TOTAL        TOTAL ORG.   TOTAL
                                                                                 PHOSPHATE    PHOSPHATE    (CALCD.)     (CALCD.)
                   SUBM      CA           MG           NA           K            P            P            N            N
                   ID        MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)               23(0)        23(0)        23(0)        23(0)        10(0)        11(0)        12(11)       23(9)
           LOW               35.          7.           3.           .6           .027         .019         Q.100        Q.410
          HIGH               49.          13.0         13.          2.7          .166         .940         Q.400        4.020
       AVERAGE               42.          11.2         7.9          1.2          .110         .250         .167*        1.115*
      STD.DEV.               4.           1.4          2.8          .5           .050         .296         .098*        .849*
  PERCNT:10TH                37.          10.          4.           .9           .044         .060         Q.100        Q.550
          25TH               39.          10.          6.           1.0          .066         .090         .100         Q.650
   MEDIAN 50TH               42.          11.0         7.           1.1          .116         .112         .100         Q.800
          75TH               44.          12.          9.           1.4          .154         .360         .200         1.230
          90TH               48.          13.          12.          1.8          .163         .680         Q.300        2.080
SECONDARY CODE                                                                                21L

                             07021L       07503L       07562L       07205L       07206L       07105L       07906L       10407L
                             NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN     RESIDUE
                             TOTAL        TOTAL        DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED    PARTICULATE  NONFILTRABLE
                             KJELDAHL     AMMONIA      AMMONIA      NITRITE      NITRITE      NO3 & NO2    TOTAL
                   SUBM      N            N            N            N            N            N            N
                   ID        MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)               23(6)        12(11)       11(1)        23(18)       12(1)        23(4)        15(2)        16(0)
           LOW               .300         L.4          L.002        L.05         .006         L.05         L.01         4.
          HIGH               3.400        .5           2.400        .140         .044         .70          1.400        209.
       AVERAGE               .827*        .41*         .531*        .059*        .022*        .288*        .203*        28.
      STD.DEV.               .731*        .03*         .826*        .022*        .013*        .182*        .337*        50.
  PERCNT:10TH                .380         L.4          .015         L.05         L.007        L.05         L.01         5.
          25TH               L.5          L.40         .051         L.05         .011         .15          .08          8.
   MEDIAN 50TH               .560         L.40         .110         L.05         .020         .30          .12          13.
          75TH               .8           L.40         .650         L.05         .034         .38          .17          22.
          90TH               1.380        L.4          1.880        .08          .038         .60          .24          55.
SECONDARY CODE               01L

                             10474L       10453L       00205L       36001L       36011L       36102L       36910L       29009L
                             RESIDUE      RESIDUE      TOTAL        COLIFORMS    COLIFORMS    STREP.       STD. PLATE   COPPER
                             TOTAL        FILTRABLE    DISSOLVED    TOTAL        FECAL        FECAL        COUNT        TOTAL
                                                       SOLIDS                                              BACT.DENS.
                   SUBM                                             MPN          MPN          MF                        CU
                   ID        MG/L         MG/L         MG/L         NO/100ML     NO/100ML     NO/100ML     NO/ML        MG/L
SAMPLES(FLAGS)               16(0)        16(0)        23(0)        21(0)        21(1)        21(2)        18(0)        23(5)
           LOW               247.         240.         137.         32.          L2.          L2.          100.         L.001
          HIGH               469.         340.         222.         15000.       13000.       1500.        27000.       .009
       AVERAGE               300.         272.         186.         3111.        860.*        147.*        3700.        .003*
      STD.DEV.               53.          29.          18.          4383.        2816.*       331.*        6390.        .002*
  PERCNT:10TH                260.         240.         163.         100.         6.           2.           140.         L.001
          25TH               267.         255.         175.         220.         16.          6.           730.         .002
   MEDIAN 50TH               283.         260.         188.         1300.        88.          42.          1400.        .002
          75TH               320.         285.         198.         3000.        310.         120.         3300.        .005
          90TH               348.         320.         206.         9700.        1300.        210.         11000.       .006
SECONDARY CODE                                                      02L          12L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  51                      NAQUADAT SUMMARY REPORT  APR 30, 1986
                                                      SURFACE WATER DATA
STATION 00AL05EC2303    LAT. 53D 59M 22S  LONG. 112D 28M 47S   PR 3   UTM 12 403000E 5983150N  FOR MAY 19, 1982 TO MAR 01, 1984
 NORTH SASKATCHEWAN RIVER    RIGHT BANK     ABOVE PAKAN BRIDGE        90M UPSTREAM

                           30009L      26304L      13306L      25003L      28009L      42009L      27009L      33005L
                            ZINC        IRON      ALUMINUM   MANGANESE     NICKEL    MOLYBDENUM    COBALT     ARSENIC
                           TOTAL     EXTRBLE.    EXTRBLE.      TOTAL       TOTAL       TOTAL       TOTAL       TOTAL

                    SUBM     ZN          FE          AL          MN          NI          MO          CO          AS
                     ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)              23(1)       23(0)       19(0)       20(2)       23(1)       18(14)      23(21)      15(1)
           LOW              L.001         .04        .035       L.008       L.001       L.001       L.001      L.0002
          HIGH               .054        2.81       4.710        .124        .057        .006        .003       .0018
       AVERAGE               .020*        .45        .607        .029*       .010*       .002*       .001*      .0006*
      STD.DEV.               .018*        .70       1.111        .032*       .011*       .002*       .001*      .0004*
   PERCNT:10TH               .004         .05        .050        .008*       .004       L.001       L.001       .0003
          25TH               .006         .11        .090        .011        .006       L.001       L.001       .0004
   MEDIAN 50TH               .008         .16        .201        .014        .007       L.001       L.001       .0005
          75TH               .037         .51        .536        .035        .009       L.001       L.001       .0006
          90TH               .049         .89       2.120        .077        .016        .005       L.001       .0011
SECONDARY CODE

                           04304L      48009L      24009L      82302L      82009L      80015L      34005L      23009L
                          BERYLLIUM    CADMIUM    CHROMIUM      LEAD        LEAD       MERCURY    SELENIUM    VANADIUM
                           EXTRBLE.     TOTAL       TOTAL     EXTRBLE.      TOTAL       TOTAL     TOTAL         TOTAL

                    SUBM     BE          CD          CR          PB          PB          HG          SE          V
                     ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)              19(19)      23(20)      23(2)        8(5)       12(7)       11(11)      15(13)      19(8)
           LOW              L.001       L.001       L.001       L.003       L.003       L.0001      L.0002      L.002
          HIGH              L.001        .002        .011        .005        .010       L.0001       .0005       .014
       AVERAGE                           .001*       .005*       .003*       .005*                   .0002*      .004*
      STD.DEV.                           .000*       .003*       .001*       .003*                   .0001*      .003*
   PERCNT:10TH              L.001       L.001        .003                   L.003       L.0001      L.0002      L.002
          25TH              L.001       L.001        .003       L.003       L.003       L.0001      L.0002      L.002
   MEDIAN 50TH              L.001       L.001        .006       L.003       L.003       L.0001      L.0002       .003
          75TH              L.001       L.001        .008        .004        .007       L.0001      L.0002       .006
          90TH              L.001        .002        .009                    .008       L.0001       .0004       .008
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

SECTION 2

NAQUADAT Summary Report for analyses of final effluent grab samples from the sewage treatment plants licensed to discharge into the study section of the North Saskatchewan River.

```
REQUEST 0001 -  0003 PAGE   1                      NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                    INDUSTRIAL MONITORING
STATION 21AL05DF1000    LAT. 53D 22M  0S  LONG. 113D 44M  0S   PR 3   UTM 12 318150E 5916300N  FOR MAY 17, 1983 TO NOV 15, 1983
DEVON SEWAGE TREATMENT PLANT                      FINAL EFFLUENT GRAB

                        02041L        10301L        97160S        97163S
                      SPECIFIC            PH     DISCHARGE     DISCHARGE
                      CONDUCT.                     INSTANT         DAILY
                                                                    MEAN
                 SUBM
                  ID     US/CM      PH UNITS          M3/S           CFS
SAMPLES(FLAGS)           10(0)         10(0)         10(0)         10(0)
           LOW            717.           7.5         .0152         .5381
          HIGH            957.           8.4         .0247         .8714
       AVERAGE            825.                       .0191         .6742
      STD.DEV.             59.                       .0026         .0909
   PERCNT:10TH            761.           7.5         .0163         .5763
          25TH            809.           7.6         .0178         .6272
    MEDIAN 50TH           821.           7.7         .0185         .6534
          75TH            824.           7.8         .0204         .7213
          90TH            908.           8.1         .0231         .8147
SECONDARY CODE

                        08202L        08304L        06537L        06154L        06107L        06905L        10701L        97160S
                        OXYGEN        OXYGEN      PHENOLIC        CARBON        CARBON        CARBON      SURFACT.     DISCHARGE
                      BIOCHEM.         TOTAL      MATERIAL     DISSOLVED     DISSOLVED   PARTICULATE      N-ALKYL       INSTANT
                    DEMAND-BOD           COD                   INORGANIC       ORGANIC         TOTAL    SULPHNTS.
                 SUBM       O2            O2        PHENOL             C             C             C           LAS
                  ID      MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          M3/S
SAMPLES(FLAGS)           10(1)         10(1)         10(0)         10(0)         10(0)         10(0)          1(0)         10(0)
           LOW            L1.0          L5.0          .007          52.0           6.9           .60           .68         .0152
          HIGH             5.1          48.3          .012          76.0          13.0          3.76           .68         .0247
       AVERAGE             3.3*         32.8*         .009          59.5          10.0          2.06                       .0191
      STD.DEV.             1.2*         11.0*         .002           7.1           1.6          1.11                       .0026
   PERCNT:10TH             1.6*         17.0*         .007          52.5           8.0           .89                       .0163
          25TH             2.6          31.4          .007          56.0           9.6          1.19                       .0178
    MEDIAN 50TH            3.2          34.7          .010          57.0           9.9          1.82                       .0185
          75TH             3.8          36.4          .011          60.0          10.1          3.00                       .0204
          90TH             5.0          43.3          .012          71.5          12.5          3.73                       .0231
SECONDARY CODE

                        10151L        10101L        06301L        06201L        17203L        16306L        09107L        14102L
                    ALKALINITY    ALKALINITY     CARBONATE    BICARBONT.      CHLORIDE      SULPHATE      FLUORIDE        SILICA
                        PHENOL         TOTAL      (CALCD.)      (CALCD.)     DISSOLVED     DISSOLVED     DISSOLVED      REACTIVE
                     PHTHALEIN
                 SUBM    CACO3         CACO3           CO3          HCO3            CL           SO4             F          SIO2
                  ID      MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)           10(0)         10(0)         10(0)         10(0)         10(0)         10(0)         10(0)         10(0)
           LOW              .0          201.            0.          245.           37.           78.           .49          11.7
          HIGH             4.2          309.            5.          377.           48.          110.          1.32          15.6
       AVERAGE              .4          233.            1.          283.           42.           94.           .85          13.0
      STD.DEV.             1.3           33.            2.           41.            4.           11.           .25           1.1
   PERCNT:10TH              .0          207.            0.          248.           38.           81.           .58          11.8
          25TH              .0          214.            0.          258.           39.           90.           .67          12.5
    MEDIAN 50TH             .0          217.            0.          265.           41.           91.           .78          12.9
          75TH              .0          240.            0.          293.           45.          105.          1.10          13.3
          90TH             2.1          289.            3.          352.           48.          110.          1.22          14.8
SECONDARY CODE
```

```
REQUEST 0004 -  0006 PAGE   2                          NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                          INDUSTRIAL MONITORING
STATION 21AL05DF1000    LAT. 53D 22M  0S  LONG. 113D 44M  0S   PR 3   UTM 12 318150E 5916300N  FOR MAY 17, 1983 TO NOV 15, 1983
DEVON SEWAGE TREATMENT PLANT                    FINAL EFFLUENT GRAB

                         10602L      20110L      12102L      11103L      19103L       06608L       15421L       97160S
                        HARDNESS     CALCIUM    MAGNESIUM    SODIUM     POTASSIUM     CYANIDE    PHOSPHORUS   DISCHARGE
                          TOTAL     DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED                   TOTAL       INSTANT
                         (CALCD.)
                 SUBM     CACO3        CA          MG          NA          K            CN           P
                  ID      MG/L        MG/L        MG/L        MG/L        MG/L         MG/L         MG/L        M3/S
SAMPLES(FLAGS)            10(0)       10(0)       10(0)       10(0)       10(0)        10(2)        10(0)       10(0)
           LOW             211.         58.         16.         52.         7.7        L.002         .076       .0152
          HIGH             370.        102.         28.         77.        10.0         .011        6.500       .0247
       AVERAGE             257.         71.         20.         66.         9.2         .006*       4.718       .0191
      STD.DEV.              50.         14.          4.          7.          .7         .003*       2.065       .0026
  PERCNT:10TH              215.         59.         16.         57.         8.2        L.002        1.738       .0163
          25TH             222.         61.         17.         64.         9.0         .003        3.450       .0178
   MEDIAN 50TH             233.         65.         18.         65.         9.3         .007        5.300       .0185
          75TH             280.         79.         21.         70.         9.7         .009        6.400       .0204
          90TH             340.         93.         27.         77.        10.0         .010        6.500       .0231
SECONDARY CODE

                         07021L      07562L      07205L      07105L      07906L       97160S
                        NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN     DISCHARGE
                          TOTAL     DISSOLVED   DISSOLVED   DISSOLVED  PARTICULATE    INSTANT
                        KJELDAHL     AMMONIA     NITRITE    NO3 & NO2    TOTAL
                 SUBM       N           N           N           N           N
                  ID      MG/L        MG/L        MG/L        MG/L        MG/L         M3/S
SAMPLES(FLAGS)            9(0)        10(0)       9(0)        10(0)       10(4)        10(0)
           LOW            2.360       1.100        .12        6.00         L.01        .0152
          HIGH            7.750       6.200        .54       11.00          .27        .0247
       AVERAGE            4.712       3.071        .357       8.170         .10*       .0191
      STD.DEV.            1.604       1.554        .154       1.470         .09*       .0026
  PERCNT:10TH                         1.100                   6.500        L.01        .0163
          25TH            3.600       2.000        .30        7.00         L.01        .0178
   MEDIAN 50TH            4.350       3.395        .35        8.350         .08        .0185
          75TH            5.500       3.920        .48        8.70          .17        .0204
          90TH                        5.150                  10.350         .24        .0231
SECONDARY CODE

                         10407L      10474L      10453L      00205L      36011L       36001L       36102L       36910L
                         RESIDUE     RESIDUE     RESIDUE      TOTAL     COLIFORMS    COLIFORMS     STREP.     STD. PLATE
                      NONFILTRABLE    TOTAL     FILTRABLE   DISSOLVED     FECAL        TOTAL        FECAL        COUNT
                                                             SOLIDS                                           BACT.DENS.
                 SUBM                                                      MPN          MPN          MF
                  ID      MG/L        MG/L        MG/L        MG/L      NO/100ML     NO/100ML     NO/100ML      NO/ML
SAMPLES(FLAGS)            1(0)        1(0)        1(0)        10(0)       10(3)        10(1)        9(2)        10(0)
           LOW              6.        516.        510.        448.         L2.          L2.          L2.          80.
          HIGH              6.        516.        510.        563.         14.         490.         960.        2500.
       AVERAGE                                                478.          4.*         85.*        127.*        751.
      STD.DEV.                                                 37.          4.*        151.*        314.*        705.
  PERCNT:10TH                                                 449.         L2.           2.*                      115.
          25TH                                                455.          2.           8.           2.          160.
   MEDIAN 50TH                                                465.          2.          32.          12.          638.
          75TH                                                482.          5.          46.          42.          800.
          90TH                                                542.         12.*        335.                      1850.
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE   3                       NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                      INDUSTRIAL MONITORING
STATION 21AL05DF1000    LAT. 53D 22M  0S  LONG. 113D 44M  0S   PR 3   UTM 12 318150E 5916300N  FOR MAY 17, 1983 TO NOV 15, 1983
DEVON SEWAGE TREATMENT PLANT              FINAL EFFLUENT GRAB

                           29009L      30009L      26304L      13306L      25003L      28009L      42009L      27009L
                           COPPER       ZINC        IRON      ALUMINUM   MANGANESE     NICKEL   MOLYBDENUM     COBALT
                            TOTAL       TOTAL     EXTRBLE.    EXTRBLE.     TOTAL       TOTAL       TOTAL       TOTAL

                  SUBM       CU          ZN          FE          AL          MN          NI          MO          CO
                   ID       MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)             10(3)       10(0)       10(0)       10(0)       10(0)       10(0)       10(8)       10(9)
           LOW              L.001        .010         .05        .035        .045        .004       L.001       L.001
          HIGH               .020        .023         .31         .75        .137        .011        .006        .002
       AVERAGE               .006*       .013         .12        .141        .071        .006        .002*       .001*
      STD.DEV.               .007*       .004         .08        .216        .025        .002        .002*       .000*
   PERCNT:10TH              L.001        .011         .06        .035        .050        .004       L.001       L.001
          25TH              L.001        .011         .06        .065        .058        .005       L.001       L.001
    MEDIAN 50TH              .004        .012         .10        .075        .065        .006       L.001       L.001
          75TH               .005        .013         .15        .105        .075        .006       L.001       L.001
          90TH               .018        .020         .26        .435        .108        .009        .005        .001*
SECONDARY CODE
                           33005L      04304L      48009L      24009L      82302L      80015L      34005L      23009L
                           ARSENIC    BERYLLIUM    CADMIUM    CHROMIUM       LEAD      MERCURY    SELENIUM    VANADIUM
                          TOTAL        EXTRBLE.    TOTAL       TOTAL      EXTRBLE.     TOTAL     TOTAL         TOTAL

                  SUBM       AS          BE          CD          CR          PB          HG          SE          V
                   ID       MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)             10(0)       10(10)      10(8)       10(0)       10(8)        9(9)      10(9)       10(2)
           LOW              .0008       L.001       L.001        .003       L.003      L.0001     L.0002       L.002
          HIGH              .0014       L.001        .003        .010        .005      L.0001      .0005        .006
       AVERAGE              .0010                    .001*       .005        .003*                 .0002*      .004*
      STD.DEV.              .0002                    .001*       .002        .001*                 .0001*      .001*
   PERCNT:10TH              .0008       L.001       L.001        .003       L.003                 L.0002       L.002
          25TH              .0008       L.001       L.001        .003       L.003      L.0001     L.0002        .003
    MEDIAN 50TH             .0010       L.001       L.001        .005       L.003      L.0001     L.0002        .004
          75TH              .0011       L.001       L.001        .005       L.003      L.0001     L.0002        .005
          90TH              .0013       L.001        .003        .008        .005                  .0003*       .006
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE   4                          NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                         INDUSTRIAL MONITORING
STATION 21AL05EB1000    LAT. 53D 33M  0S  LONG. 113D 28M  0S   PR 3   UTM 12 336600E 5936050N  FOR MAY 17, 1983 TO NOV 16, 1983
EDMONTON GOLD BAR S.T.P.                              FINAL EFFLUENT GRAB

                          02041L       10301L       97160S       97163S
                         SPECIFIC        PH        DISCHARGE    DISCHARGE
                         CONDUCT.                   INSTANT       DAILY
                   SUBM                                           MEAN
                    ID    US/CM       PH UNITS       M3/S          CFS
  SAMPLES(FLAGS)          10(0)        10(0)         10(0)        10(0)
             LOW           420.          7.1         2.6111       92.202
            HIGH          1101.          7.9         4.1435       146.32
         AVERAGE           851.                      3.0462       107.566
        STD.DEV.           185.                       .5074       17.9171
    PERCNT:10TH            601.          7.2         2.6290       92.8360
            25TH           805.          7.2         2.7627       97.557
     MEDIAN 50TH           862.          7.2         2.8101       99.2320
            75TH           902.          7.5         3.2639       115.25
            90TH          1084.          7.7         3.9265       138.655
  SECONDARY CODE

                          08202L       08304L       06537L       06154L       06107L       06905L       10701L       97160S
                          OXYGEN       OXYGEN      PHENOLIC      CARBON       CARBON       CARBON      SURFACT.     DISCHARGE
                         BIOCHEM.      TOTAL       MATERIAL     DISSOLVED    DISSOLVED   PARTICULATE   N-ALKYL       INSTANT
                        DEMAND-BOD      COD                     INORGANIC     ORGANIC       TOTAL      SULPHNTS.
                   SUBM     02          02          PHENOL          C            C            C           LAS
                    ID    MG/L         MG/L         MG/L          MG/L         MG/L         MG/L         MG/L         M3/S
  SAMPLES(FLAGS)          10(0)        10(0)        10(0)         10(0)        10(0)        10(1)                     10(0)
             LOW            5.1         27.2         .010          29.0          5.8         L.01                     2.6111
            HIGH           55.2         50.2         .052          56.0         12.0         6.69                     4.1435
         AVERAGE           22.7         37.5         .016          42.2          9.3         2.59*                    3.0462
        STD.DEV.           13.2          6.6         .013           8.4          1.8         2.12*                     .5074
    PERCNT:10TH             8.5         28.6         .010          29.5          6.8          .52*                    2.6290
            25TH           15.0         32.9         .011          38.4          7.9         1.06                     2.7627
     MEDIAN 50TH           22.4         38.8         .012          43.0          9.6         2.15                     2.8101
            75TH           24.9         40.6         .015          47.0         11.0         3.52                     3.2639
            90TH           40.6         45.6         .035          53.5         11.5         6.12                     3.9265
  SECONDARY CODE

                          10151L       10101L       06301L       06201L       17203L       16306L       09107L       14102L
                        ALKALINITY   ALKALINITY   CARBONATE    BICARBONT.    CHLORIDE     SULPHATE     FLUORIDE      SILICA
                          PHENOL       TOTAL       (CALCD.)     (CALCD.)    DISSOLVED    DISSOLVED    DISSOLVED     REACTIVE
                        PHTHALEIN
                   SUBM   CACO3        CACO3         CO3          HCO3          CL           S04           F           SIO2
                    ID    MG/L         MG/L         MG/L         MG/L          MG/L         MG/L         MG/L         MG/L
  SAMPLES(FLAGS)          10(0)        10(0)        10(0)         10(0)        10(0)        10(0)        10(0)        10(0)
             LOW             .0         113.           0.          138.          44.         127.          .57          8.2
            HIGH             .0         205.           0.          250.          66.         270.         1.21         12.2
         AVERAGE             .0         155.           0.          188.          52.         174.         1.05          9.5
        STD.DEV.             .0          33.           0.           40.           7.          58.          .19          1.2
    PERCNT:10TH              .0         115.           0.          140.          44.         129.          .72          8.2
            25TH             .0         122.           0.          149.          47.         135.         1.04          8.4
     MEDIAN 50TH             .0         155.           0.          189.          51.         140.         1.13          9.2
            75TH             .0         186.           0.          227.          56.         230.         1.15         10.1
            90TH             .0         198.           0.          241.          61.         268.         1.18         11.4
  SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE   5                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                    INDUSTRIAL MONITORING
STATION 21AL05EB1000   LAT. 53D 33M  0S  LONG. 113D 28M  0S   PR 3   UTM 12 336600E 5936050N  FOR MAY 17, 1983 TO NOV 16, 1983
EDMONTON GOLD BAR S.T.P.                    FINAL EFFLUENT GRAB

                          10602L      20110L      12102L      11103L      19103L      06608L      15421L      97160S
                         HARDNESS    CALCIUM     MAGNESIUM    SODIUM     POTASSIUM    CYANIDE    PHOSPHORUS  DISCHARGE
                          TOTAL     DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED                 TOTAL      INSTANT
                         (CALCD.)
                  SUBM    CACO3        CA          MG          NA          K           CN          P
                   ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        M3/S
SAMPLES(FLAGS)            10(0)       10(0)       10(0)       10(0)       10(0)       10(0)       10(0)       10(0)
           LOW             162.         40.         15.         67.         9.5        .003       2.050      2.6111
          HIGH             394.         92.         40.         81.        11.0        .010       5.050      4.1435
       AVERAGE             236.         57.         23.         76.        10.2        .005       3.535      3.0462
      STD.DEV.              87.         19.         10.          4.          .5        .002       1.066       .5074
   PERCNT:10TH             164.         40.         15.         70.         9.5        .003       2.175      2.6290
          25TH             179.         47.         16.         73.         9.8        .004       2.450      2.7627
   MEDIAN 50TH             197.         50.         18.         78.        10.1        .004       3.775      2.8101
          75TH             273.         63.         28.         79.        10.5        .006       4.250      3.2639
          90TH             390.         92.         39.         80.        11.0        .009       4.925      3.9265
SECONDARY CODE

                          07021L      07562L      07205L      07105L      07906L      97160S
                         NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN   DISCHARGE
                          TOTAL     DISSOLVED   DISSOLVED   DISSOLVED  PARTICULATE   INSTANT
                         KJELDAHL    AMMONIA     NITRITE    NO3 & NO2    TOTAL
                  SUBM      N           N           N           N           N
                   ID     MG/L        MG/L        MG/L        MG/L        MG/L        M3/S
SAMPLES(FLAGS)             9(0)       10(0)       10(0)       10(0)       10(1)       10(0)
           LOW            2.600       1.730         .32        1.87        L.01      2.6111
          HIGH           26.000      21.600       18.20       18.50        6.70      4.1435
       AVERAGE           12.422      10.789       3.156       6.714       1.08*      3.0462
      STD.DEV.            7.634       7.061       5.414       4.953       2.02*       .5074
   PERCNT:10TH                        2.365        .320       1.995        .02*      2.6290
          25TH            7.500       4.600         .45        2.25         .09      2.7627
   MEDIAN 50TH            9.500       9.330       1.240       6.000         .47      2.8101
          75TH           16.500      17.200        2.62        8.50        1.06      3.2639
          90TH                       20.600      11.100      13.600        3.93      3.9265
SECONDARY CODE

                          10407L      10474L      10453L      00205L      36011L      36001L      36102L      36910L
                         RESIDUE     RESIDUE     RESIDUE      TOTAL     COLIFORMS   COLIFORMS     STREP.   STD. PLATE
                       NONFILTRABLE   TOTAL     FILTRABLE   DISSOLVED     FECAL       TOTAL       FECAL       COUNT
                                                             SOLIDS                                         BACT.DENS.
                  SUBM                                                    MPN         MPN          MF
                   ID     MG/L        MG/L        MG/L        MG/L      NO/100ML    NO/100ML    NO/100ML      NO/ML
SAMPLES(FLAGS)             1(0)        1(0)        1(0)       10(0)        6(0)        7(1)        7(0)        6(0)
           LOW              10.        530.        520.        437.      20000.      23000.       6400.      14000.
          HIGH              10.        530.        520.        667.      96000.     699999.      46000.      89000.
       AVERAGE                                                 518.      67000.      57428.*     17443.      41500.
      STD.DEV.                                                  79.      33389.      34961.*     13828.      34367.
   PERCNT:10TH                                                 448.
          25TH                                                 481.      29000.      25000.       7000.      17050.
   MEDIAN 50TH                                                 485.      84000.      46000.      13000.      23500.
          75TH                                                 556.      89000.      95000.      22000.      82000.
          90TH                                                 656.
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE   6                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 21AL05EB1000    LAT. 53D 33M  0S  LONG. 113D 28M  0S   PR 3   UTM 12 336600E 5936050N  FOR MAY 17, 1983 TO NOV 16, 1983
EDMONTON GOLD BAR S.T.P.                    FINAL EFFLUENT GRAB

                          29009L      30009L      26304L      13306L      25003L      28009L      42009L      27009L
                          COPPER       ZINC        IRON      ALUMINUM    MANGANESE    NICKEL    MOLYEDENUM    COBALT
                           TOTAL       TOTAL     EXTRBLE.    EXTRBLE.     TOTAL       TOTAL       TOTAL       TOTAL

                 SUBM       CU          ZN          FE          AL          MN          NI          MO          CO
                  ID       MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            10(1)       10(0)       10(1)       10(0)       10(0)       10(0)       10(7)       10(9)
           LOW            L.001        .039        L.02        .023        .027        .016       L.001       L.001
          HIGH             .027        .084         .28        .944        .069        .042        .005        .002
       AVERAGE             .008*       .057         .12*       .145        .045        .021        .002*       .001*
      STD.DEV.             .008*       .014         .07*       .282        .014        .008        .002*       .000*
   PERCNT:10TH             .001*       .043         .04*       .029        .028        .016       L.001       L.001
          25TH             .003        .047         .08        .035        .036        .017       L.001       L.001
   MEDIAN 50TH             .005        .054         .11        .055        .044        .020       L.001       L.001
          75TH             .012        .066         .15        .085        .052        .022        .004       L.001
          90TH             .021        .078         .22        .520        .066        .033        .005        .001*
SECONDARY CODE

                          33005L      04304L      48009L      24009L      82302L      80015L      34005L      23009L
                          ARSENIC    BERYLLIUM    CADMIUM    CHROMIUM      LEAD      MERCURY     SELENIUM    VANADIUM
                          TOTAL      EXTRBLE.     TOTAL       TOTAL      EXTRBLE.     TOTAL      TOTAL        TOTAL

                 SUBM       AS          BE          CD          CR          PB          HG          SE          V
                  ID       MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            10(0)       10(10)      10(7)       10(0)       10(6)        9(9)       10(10)      10(4)
           LOW            .0006       L.001       L.001        .007       L.003      L.0001      L.0002       L.002
          HIGH            .0011       L.001        .003        .035        .012      L.0001      L.0002        .006
       AVERAGE            .0009                    .001*       .017        .005*                              .004*
      STD.DEV.            .0002                    .001*       .008        .003*                              .002*
   PERCNT:10TH            .0007       L.001       L.001        .009       L.003                  L.0002       L.002
          25TH            .0007       L.001       L.001        .010       L.003      L.0001      L.0002       L.002
   MEDIAN 50TH            .0009       L.001       L.001        .017       L.003      L.0001      L.0002        .004
          75TH            .0010       L.001        .002        .021        .006      L.0001      L.0002        .005
          90TH            .0011       L.001        .003        .029        .010      L.0001      L.0002        .006
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE   7                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                  INDUSTRIAL MONITORING
STATION 21AL05EB2000    LAT. 53D 35M 20S  LONG. 113D 21M 50S   PR 3   UTM 12 343550E 5940150N  FOR JUN 16, 1983 TO SEP 21, 1983
BREMNER SEWAGE LAGOONS                    FINAL EFFLUENT GRAB

                       02041L      10301L      97160S      97163S
                      SPECIFIC       PH       DISCHARGE   DISCHARGE
                      CONDUCT.                 INSTANT      DAILY
                                                            MEAN
                  SUBM
                   ID   US/CM      PH UNITS      M3/S        CFS
SAMPLES(FLAGS)          5(0)        5(0)         5(0)        5(0)
           LOW          1336.          7.6       .2292      8.0923
          HIGH          1574.          8.0      1.3993     49.412
       AVERAGE          1468.                    .5394     19.0456
      STD.DEV.            94.                    .4896     17.2902
   PERCNT:10TH
          25TH          1417.          7.7       .2697      9.5227
    MEDIAN 50TH         1482.          7.8       .3241     11.444
          75TH          1531.          7.9       .4745     16.757
          90TH
SECONDARY CODE

                       08202L      08304L      06537L      06154L      06107L      06905L      10701L      97160S
                       OXYGEN      OXYGEN     PHENOLIC     CARBON      CARBON      CARBON     SURFACT.   DISCHARGE
                      BIOCHEM.      TOTAL     MATERIAL   DISSOLVED   DISSOLVED  PARTICULATE  N-ALKYL     INSTANT
                     DEMAND-BOD      COD                 INORGANIC    ORGANIC      TOTAL    SULPHNTS.
                  SUBM   02          02        PHENOL        C           C           C         LAS
                   ID   MG/L        MG/L        MG/L        MG/L        MG/L        MG/L       MG/L        M3/S
SAMPLES(FLAGS)          5(0)        5(0)        5(0)        5(0)        5(0)        5(0)                   5(0)
           LOW          34.0       139.0        .028       120.0        22.0        7.63                  .2292
          HIGH         167.5       296.0        .454       150.0        53.0       45.92                 1.3993
       AVERAGE         114.5       240.8        .240       140.0        38.2       16.86                  .5394
      STD.DEV.          52.7        62.3        .198        12.2        11.3       16.46                  .4896
   PERCNT:10TH
          25TH          93.0       226.4        .033       140.0        34.0        7.87                  .2697
    MEDIAN 50TH        130.0       266.8        .306       140.0        41.0        8.80                  .3241
          75TH         148.0       276.0        .379       150.0        41.0       14.10                  .4745
          90TH
SECONDARY CODE

                       10151L      10101L      06301L      06201L      17203L      16306L      09107L      14102L
                     ALKALINITY  ALKALINITY   CARBONATE   BICARBONT.   CHLORIDE    SULFHATE    FLUORIDE     SILICA
                       PHENOL       TOTAL      (CALCD.)    (CALCD.)   DISSOLVED   DISSOLVED   DISSOLVED   REACTIVE
                     PHTHALEIN
                  SUBM  CACO3       CACO3        CO3       HCO3          CL          SO4          F         SIO2
                   ID   MG/L        MG/L        MG/L       MG/L         MG/L        MG/L        MG/L       MG/L
SAMPLES(FLAGS)          5(0)        5(0)        5(0)        5(0)        5(0)        5(0)        5(0)       5(0)
           LOW            .0        525.          0.        640.         54.         30.         .75       16.0
          HIGH            .0        634.          0.        773.         69.        118.         .80       18.4
       AVERAGE            .0        603.          0.        736.         62.         65.         .78       17.4
      STD.DEV.            .0         45.          0.         54.          6.         41.         .02         .9
   PERCNT:10TH
          25TH            .0        615.          0.        750.         58.         35.         .77       17.3
    MEDIAN 50TH           .0        615.          0.        750.         61.         40.         .79       17.5
          75TH            .0        628.          0.        766.         67.        100.         .80       17.8
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE   8                         NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                        INDUSTRIAL MONITORING
STATION 21AL05EB2000    LAT. 53D 35M 20S  LONG. 113D 21M 50S   PR 3   UTM 12 343550E 5940150N  FOR JUN 16, 1983 TO SEP 21, 1983
BREMNER SEWAGE LAGOONS                    FINAL EFFLUENT GRAB

                           10602L       20110L       12102L       11103L       19103L       06608L       15421L       97160S
                          HARDNESS      CALCIUM     MAGNESIUM     SODIUM      POTASSIUM     CYANIDE    PHOSPHORUS   DISCHARGE
                           TOTAL       DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED                  TOTAL       INSTANT
                          (CALCD.)
                   SUBM    CACO3          CA           MG           NA           K            CN           P
                    ID     MG/L          MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         M3/S
SAMPLES(FLAGS)             5(0)          5(0)         5(0)         5(0)         5(0)         5(0)         5(0)         5(0)
           LOW             230.           64.          17.          76.         14.0         .004        7.000        .2292
          HIGH             349.           97.          27.          90.         18.0         .020       12.800       1.3993
       AVERAGE             294.           81.          22.          82.         16.5         .014        9.960        .5394
      STD.DEV.              52.           14.           4.           6.          1.5         .007        2.547        .4896
   PERCNT:10TH
          25TH             257.           70.          20.          77.         16.7         .011        7.750        .2697
   MEDIAN 50TH             291.           82.          21.          83.         17.0         .015       10.250        .3241
          75TH             341.           92.          26.          86.         17.0         .019       12.000        .4745
          90TH
SECONDARY CODE

                           07021L       07562L       07205L       07105L       07906L       97160S
                          NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN    DISCHARGE
                           TOTAL       DISSOLVED    DISSOLVED    DISSOLVED  PARTICULATE    INSTANT
                          KJELDAHL     AMMONIA      NITRITE      NO3 & NO2     TOTAL
                   SUBM      N            N            N            N            N
                    ID     MG/L          MG/L         MG/L         MG/L         MG/L         M3/S
SAMPLES(FLAGS)             5(0)          5(0)         5(3)         5(3)         5(0)         5(0)
           LOW            50.000        38.300        L.05         L.05         1.33         .2292
          HIGH            101.00        90.600         .49          .42         9.48        1.3993
       AVERAGE            88.200        75.600        .142*        .128*        3.41         .5394
      STD.DEV.            21.534        21.464        .195*        .163*        3.44         .4896
   PERCNT:10TH
          25TH            95.000        77.100        L.05         L.05         1.59         .2697
   MEDIAN 50TH            95.000        84.000        L.05         L.05         1.80         .3241
          75TH            100.00        88.000         .07          .07         2.85         .4745
          90TH
SECONDARY CODE
                           10407L       10474L       10453L       00205L       36011L       36001L       36102L       36910L
                          RESIDUE      RESIDUE      RESIDUE       TOTAL      COLIFORMS    COLIFORMS     STREP.     STD. PLATE
                        NONFILTRABLE    TOTAL      FILTRABLE    DISSOLVED      FECAL        TOTAL        FECAL        COUNT
                                                                 SOLIDS                                            BACT.DENS.
                   SUBM                                                         MPN          MPN          MF
                    ID     MG/L          MG/L         MG/L         MG/L      NO/100ML     NO/100ML     NO/100ML       NO/ML
SAMPLES(FLAGS)                                                     5(0)         5(0)         5(0)         5(0)         5(0)
           LOW                                                     725.       13000.       13000.        3400.        5300.
          HIGH                                                     846.       41000.       58000.       94000.       75000.
       AVERAGE                                                     767.       24200.       44200.       40260.       33060.
      STD.DEV.                                                      46.       10733.       19753.       37942.       27447.
   PERCNT:10TH
          25TH                                                     750.       17000.       36000.        3900.       20000.
   MEDIAN 50TH                                                     756.       25000.       56000.       50000.       20000.
          75TH                                                     757.       25000.       58000.       50000.       45000.
          90TH
SECONDARY CODE
```

```
REQUEST 0007 -  0009 PAGE   9                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 21AL05EB2000    LAT. 53D 35M 20S  LONG. 113D 21M 50S   PR 3   UTM 12 343550E 5940150N  FOR JUN 16, 1983 TO SEP 21, 1983
BREMNER SEWAGE LAGOONS                          FINAL EFFLUENT GRAB

                          29009L      30009L      26304L      13306L      25003L      28009L      42009L      27009L
                          COPPER      ZINC        IRON        ALUMINUM    MANGANESE   NICKEL      MOLYBDENUM  COBALT
                          TOTAL       TOTAL       EXTRBLE.    EXTRBLE.    TOTAL       TOTAL       TOTAL       TOTAL

                SUBM      CU          ZN          FE          AL          MN          NI          MO          CO
                 ID       MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            5(0)        5(0)        5(0)        5(0)        5(0)        5(0)        5(3)        5(2)
           LOW             .015        .003        .51         .020        .070        .010       L.001       L.001
          HIGH             .033        .045        .67         .300        .099        .017        .006        .003
       AVERAGE             .024        .027        .61         .177        .086        .014        .003*       .002*
      STD.DEV.             .007        .016        .06         .113        .011        .003        .002*       .001*
  PERCNT:10TH
          25TH             .018        .024        .61         .130        .082        .012       L.001       L.001
   MEDIAN 50TH             .025        .027        .61         .164        .084        .015       L.001        .003
          75TH             .027        .036        .66         .273        .094        .015        .004        .003
          90TH
SECONDARY CODE

                          33005L      04304L      48009L      24009L      82302L      80015L      34005L      23009L
                          ARSENIC     BERYLLIUM   CADMIUM     CHROMIUM    LEAD        MERCURY     SELENIUM    VANADIUM
                          TOTAL       EXTRBLE.    TOTAL       TOTAL       EXTRBLE.    TOTAL       TOTAL       TOTAL

                SUBM      AS          BE          CD          CR          PB          HG          SE          V
                 ID       MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            5(0)        5(5)        5(1)        5(0)        5(1)        5(4)        5(0)        5(1)
           LOW             .0014      L.001       L.001        .022       L.003       L.0001       .0004      L.002
          HIGH             .0020      L.001        .004        .062        .012        .0002       .0015       .007
       AVERAGE             .0017                   .002*       .038        .007*       .0001*      .0007       .004*
      STD.DEV.             .0002                   .001*       .017        .004*       .0000*      .0004       .002*
  PERCNT:10TH
          25TH             .0015      L.001        .002        .023        .004       L.0001       .0005       .003
   MEDIAN 50TH             .0017      L.001        .002        .036        .006       L.0001       .0006       .004
          75TH             .0017      L.001        .002        .049        .008       L.0001       .0006       .005
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

REQUEST 0001 - 0003 PAGE 10

NAQUADAT SUMMARY REPORT JAN 08, 1986
INDUSTRIAL MONITORING

STATION 21AL05EB3000 LAT. 53D 38M 0S LONG. 113D 38M 0S FR 3 UTM 12 325900E 5945750N FOR MAY 18, 1983 TO SEP 21, 1983
ST.ALBERT SEWAGE LAGOONS FINAL EFFLUENT GRAB

	SUBM ID	02041L SPECIFIC CONDUCT. US/CM	10301L PH PH UNITS	97160S DISCHARGE INSTANT M3/S	97163S DISCHARGE DAILY MEAN CFS
SAMPLES(FLAGS)		7(0)	7(0)	7(0)	7(0)
LOW		932.	7.2	.1266	4.4687
HIGH		1120.	7.7	.1754	6.1926
AVERAGE		1025.		.1407	4.9880
STD.DEV.		80.		.0174	.6098
PERCNT:10TH					
25TH		968.	7.4	.1298	4.5836
MEDIAN 50TH		975.	7.5	.1345	4.7507
75TH		1116.	7.6	.1522	5.3752
90TH					
SECONDARY CODE					

	SUBM ID	08202L OXYGEN BIOCHEM. DEMAND-BOD O2 MG/L	08304L OXYGEN TOTAL COD O2 MG/L	06537L PHENOLIC MATERIAL PHENOL MG/L	06154L CARBON DISSOLVED INORGANIC C MG/L	06107L CARBON DISSOLVED ORGANIC C MG/L	06905L CARBON PARTICULATE TOTAL C MG/L	10701L SURFACT. N-ALKYL SULPHNTS. LAS MG/L	97160S DISCHARGE INSTANT M3/S
SAMPLES(FLAGS)		7(0)	7(0)	7(0)	7(0)	7(0)	7(0)		7(0)
LOW		20.0	65.6	.014	63.0	12.0	4.50		.1266
HIGH		49.3	176.6	.206	76.0	25.0	20.92		.1754
AVERAGE		32.2	111.4	.071	69.4	18.6	9.70		.1407
STD.DEV.		11.6	38.4	.082	5.3	5.6	5.51		.0174
PERCNT:10TH									
25TH		23.0	73.5	.014	66.0	13.0	5.90		.1298
MEDIAN 50TH		28.5	108.5	.029	66.0	16.0	9.10		.1345
75TH		47.5	137.1	.171	75.0	24.0	11.00		.1522
90TH									
SECONDARY CODE									

	SUBM ID	10151L ALKALINITY PHENOL PHTHALEIN CACO3 MG/L	10101L ALKALINITY TOTAL CACO3 MG/L	06301L CARBONATE (CALCD.) CO3 MG/L	06201L BICARBONT. (CALCD.) HCO3 MG/L	17203L CHLORIDE DISSOLVED CL MG/L	16306L SULPHATE DISSOLVED SO4 MG/L	09107L FLUORIDE DISSOLVED F MG/L	14102L SILICA REACTIVE SIO2 MG/L
SAMPLES(FLAGS)		7(0)	7(0)	7(0)	7(0)	7(0)	7(0)	7(0)	7(0)
LOW		.0	249.	0.	304.	32.	104.	.67	12.5
HIGH		.0	312.	0.	380.	42.	265.	.98	14.3
AVERAGE		.0	278.	0.	339.	37.	174.	.84	13.2
STD.DEV.		.0	24.	0.	29.	4.	68.	.12	.6
PERCNT:10TH									
25TH		.0	252.	0.	307.	34.	110.	.73	12.8
MEDIAN 50TH		.0	272.	0.	332.	38.	175.	.84	13.2
75TH		.0	299.	0.	364.	41.	250.	.95	13.7
90TH									
SECONDARY CODE									

* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q

```
REQUEST 0004 -  0006 PAGE  11                          NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                         INDUSTRIAL MONITORING
STATION 21AL05EB3000     LAT. 53D 38M  0S  LONG. 113D 38M  0S   PR 3   UTM 12 325900E 5945750N  FOR MAY 18, 1983 TO SEP 21, 1983
ST.ALBERT SEWAGE LAGOONS                              FINAL EFFLUENT GRAB

                          10602L      20110L      12102L      11103L      19103L      06608L      15421L      97160S
                         HARDNESS     CALCIUM    MAGNESIUM    SODIUM     POTASSIUM    CYANIDE   PHOSPHORUS   DISCHARGE
                          TOTAL      DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED                TOTAL      INSTANT
                         (CALCD.)
                   SUBM   CACO3         CA          MG          NA          K           CN          P
                    ID    MG/L         MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        M3/S
SAMPLES(FLAGS)             7(0)         7(0)        7(0)        7(0)        7(0)        7(3)        7(0)        7(0)
           LOW            175.          47.         14.         58.         9.3        L.002       6.000       .1266
          HIGH            333.          92.         26.         73.        13.0         .014      10.300       .1754
       AVERAGE            249.          67.         20.         67.        11.0         .006*      8.157       .1407
      STD.DEV.             69.          19.          5.          5.         1.5         .005*      1.767       .0174
  PERCNT:10TH
          25TH            182.          48.         15.         65.         9.7        L.002       6.500       .1298
   MEDIAN 50TH            266.          70.         21.         68.        10.5         .003       7.750       .1345
          75TH            332.          90.         25.         72.        12.5         .010       9.800       .1522
          90TH
SECONDARY CODE

                          07021L      07562L      07205L      07105L      07906L      97160S
                         NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    DISCHARGE
                          TOTAL      DISSOLVED   DISSOLVED   DISSOLVED  PARTICULATE   INSTANT
                         KJELDAHL    AMMONIA     NITRITE     NO3 & NO2    TOTAL
                   SUBM     N           N           N           N           N
                    ID    MG/L        MG/L        MG/L        MG/L        MG/L         M3/S
SAMPLES(FLAGS)             7(0)        7(0)        7(3)        7(3)        7(0)        7(0)
           LOW           29.500      15.000       L.05        L.05         .60        .1266
          HIGH           45.000      36.200      21.00       21.00        4.90        .1754
       AVERAGE           37.171      27.886       3.376*      3.471*      2.36        .1407
      STD.DEV.            5.914       8.168       7.808*      7.792*      1.59        .0174
  PERCNT:10TH
          25TH           31.000      21.600       L.05        L.05        1.20        .1298
   MEDIAN 50TH           36.500      27.200        .16         .18        1.79        .1345
          75TH           43.500      35.600       2.12        2.75        4.20        .1522
          90TH
SECONDARY CODE

                          10407L      10474L      10453L      00205L      36011L      36001L      36102L      36910L
                         RESIDUE     RESIDUE     RESIDUE      TOTAL     COLIFORMS   COLIFORMS     STREP.   STD. PLATE
                       NONFILTRABLE   TOTAL     FILTRABLE   DISSOLVED     FECAL       TOTAL       FECAL       COUNT
                                                              SOLIDS                                       BACT.DENS.
                   SUBM                                                    MPN         MPN          MF
                    ID    MG/L        MG/L        MG/L        MG/L      NO/100ML    NO/100ML    NO/100ML      NO/ML
SAMPLES(FLAGS)                                                7(0)        6(0)        5(0)        6(0)        5(1)
           LOW                                                495.        630.       4800.         90.      14000.
          HIGH                                                674.      79000.      89000.       4100.      99999.
       AVERAGE                                                574.      21855.      33560.       1620.      72800.*
      STD.DEV.                                                 63.      29365.      33870.       1678.      35344.*
  PERCNT:10TH
          25TH                                                525.       2600.      16000.        430.      70000.
   MEDIAN 50TH                                                571.      11950.      16000.        900.      80000.
          75TH                                                630.      25000.      42000.       3300.     G99999.
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  12                          NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                          INDUSTRIAL MONITORING
STATION 21AL05EB3000    LAT. 53D 38M  0S  LONG. 113D 38M  0S   PR 3   UTM 12 325900E 5945750N  FOR MAY 18, 1983 TO SEP 21, 1983
ST.ALBERT SEWAGE LAGOONS                             FINAL EFFLUENT GRAB

                          29009L     30009L     26304L     13306L     25003L     28009L     42009L      27009L
                          COPPER      ZINC       IRON     ALUMINUM   MANGANESE   NICKEL   MOLYBDENUM    COBALT
                           TOTAL      TOTAL    EXTRBLE.   EXTRBLE.     TOTAL      TOTAL      TOTAL       TOTAL

                  SUBM      CU         ZN         FE         AL         MN         NI         MO          CO
                   ID      MG/L       MG/L       MG/L       MG/L       MG/L       MG/L       MG/L        MG/L
SAMPLES(FLAGS)             7(0)       7(0)       7(0)       7(0)       7(0)       6(0)       7(4)        7(7)
           LOW             .004       .007        .18       .050       .051       .005      L.001       L.001
          HIGH             .014       .020        .43       .200       .139       .013       .005       L.001
       AVERAGE             .009       .015        .32       .104       .081       .008       .002*
      STD.DEV.             .004       .005        .11       .062       .029       .004       .002*
   PERCNT:10TH
          25TH             .005       .011        .21       .050       .062       .005      L.001       L.001
   MEDIAN 50TH             .008       .017        .35       .075       .080       .006      L.001       L.001
          75TH             .013       .019        .41       .160       .089       .013       .004       L.001
          90TH
SECONDARY CODE

                          33005L     04304L     48009L     24009L     82302L     80015L     34005L      23009L
                          ARSENIC   BERYLLIUM   CADMIUM   CHROMIUM     LEAD     MERCURY    SELENIUM    VANADIUM
                          TOTAL     EXTRBLE.     TOTAL      TOTAL    EXTRBLE.    TOTAL     TOTAL         TOTAL

                  SUBM      AS         BE         CD         CR         FB         HG         SE          V
                   ID      MG/L       MG/L       MG/L       MG/L       MG/L       MG/L       MG/L        MG/L
SAMPLES(FLAGS)             6(0)       7(7)       7(5)       7(1)       7(6)       7(6)       7(0)        7(2)
           LOW            .0011      L.001      L.001      L.001      L.003     L.0001      .0003       L.002
          HIGH            .0016      L.001       .002       .044       .008      .0001      .0013        .006
       AVERAGE            .0013                  .001*      .009*      .004*     .0001*     .0008        .003*
      STD.DEV.            .0002                  .000*      .015*      .002*     .0000*     .0003        .001*
   PERCNT:10TH
          25TH            .0011      L.001      L.001       .003      L.003     L.0001      .0005       L.002
   MEDIAN 50TH            .0013      L.001      L.001       .004      L.003     L.0001      .0008        .003
          75TH            .0014      L.001       .001       .005      L.003     L.0001      .0009        .004
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  13                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 21AL05EB4000    LAT. 53D 44M 50S  LONG. 113D 11M 45S   PR 3   UTM 12 355200E 5957400N  FOR MAY 18, 1983 TO SEP 21, 1983
FT.SASKATCHEWAN SEWAGE LAGOONS                FINAL EFFLUENT GRAB

                        02041L      10301L      97160S      97163S
                       SPECIFIC       PH       DISCHARGE   DISCHARGE
                       CONDUCT.                 INSTANT      DAILY
                                                             MEAN
                  SUBM
                   ID   US/CM      PH UNITS      M3/S         CFS
SAMPLES(FLAGS)          8(0)        8(0)         8(0)         8(0)
           LOW          858.         6.8        .0284       1.2350
          HIGH         1072.         7.4        .0407       1.4364
       AVERAGE          928.                    .0364       1.3283
      STD.DEV.           64.                    .0038        .0751
   PERCNT:10TH
          25TH          890.         7.0        .0353       1.2617
    MEDIAN 50TH         921.         7.2        .0363       1.3275
          75TH          936.         7.3        .0393       1.3884
          90TH
SECONDARY CODE

                        08202L      08304L      06537L      06154L      06107L      06905L      10701L      97160S
                        OXYGEN      OXYGEN     PHENOLIC     CARBON      CARBON      CARBON     SURFACT.   DISCHARGE
                       BIOCHEM.      TOTAL     MATERIAL   DISSOLVED   DISSOLVED  PARTICULATE  N-ALKYL     INSTANT
                      DEMAND-BOD     COD                  INORGANIC    ORGANIC      TOTAL     SULPHNTS.
                  SUBM    O2          O2        PHENOL        C           C           C          LAS
                   ID   MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        M3/S
SAMPLES(FLAGS)          8(0)        8(0)        8(0)        8(0)        8(0)        8(0)                    8(0)
           LOW          80.0       202.1        .119        72.0        18.0       12.60                   .0284
          HIGH         186.7       396.9        .202        97.0        56.0       41.00                   .0407
       AVERAGE         145.4       282.8        .162        81.0        32.9       22.51                   .0364
      STD.DEV.          38.0        73.0        .035         9.1        12.2       10.72                   .0038
   PERCNT:10TH
          25TH         115.0       216.5        .132        73.5        26.5       13.57                   .0353
    MEDIAN 50TH        164.6       268.5        .162        79.5        27.0       19.75                   .0363
          75TH         168.5       346.5        .193        86.5        41.0       29.91                   .0393
          90TH
SECONDARY CODE

                        10151L      10101L      06301L      06201L      17203L      16306L      09107L      14102L
                      ALKALINITY  ALKALINITY   CARBONATE   BICARBONT.   CHLORIDE    SULPHATE    FLUORIDE     SILICA
                        PHENOL       TOTAL      (CALCD.)    (CALCD.)   DISSOLVED   DISSOLVED   DISSOLVED   REACTIVE
                      PHTHALEIN
                  SUBM   CACO3       CACO3        CO3         HCO3         CL          SO4          F          SIO2
                   ID    MG/L        MG/L        MG/L        MG/L         MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           8(0)        8(0)        8(0)        8(0)         8(0)        8(0)        8(0)        8(0)
           LOW             .0        214.          0.        261.          42.         50.         .70        12.8
          HIGH             .0        321.          0.        391.          49.        240.         .92        21.9
       AVERAGE             .0        299.          0.        364.          45.         82.         .81        14.9
      STD.DEV.             .0         35.          0.         43.           2.         65.         .08         2.9
   PERCNT:10TH
          25TH             .0        304.          0.        370.          44.         50.         .74        13.5
    MEDIAN 50TH            .0        310.          0.        377.          45.         60.         .81        14.0
          75TH             .0        315.          0.        384.          46.         73.         .87        14.8
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  14                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 21AL05EB4000    LAT. 53D 44M 50S  LONG. 113D 11M 45S   PR 3   UTM 12 355200E 5957400N  FOR MAY 18, 1983 TO SEP 21, 1983
FT.SASKATCHEWAN SEWAGE LAGOONS              FINAL EFFLUENT GRAB

                             10602L      20110L      12102L      11103L      19103L      06608L      15421L      97160S
                            HARDNESS    CALCIUM     MAGNESIUM   SODIUM      POTASSIUM    CYANIDE    PHOSPHORUS  DISCHARGE
                             TOTAL      DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED               TOTAL        INSTANT
                            (CALCD.)
                     SUBM    CACO3        CA          MG          NA          K           CN          P
                      ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        M3/S
SAMPLES(FLAGS)               8(0)        8(0)        8(0)        8(0)        8(0)        8(0)        8(0)        8(0)
           LOW              137.          35.         12.         60.        11.2        .009       7.250       .0284
          HIGH              273.          83.         17.         76.        14.0        .020      10.300       .0407
       AVERAGE              182.          48.         15.         67.        12.2        .014       8.725       .0364
      STD.DEV.               43.          15.          2.          6.         1.0        .003       1.041       .0038
   PERCNT:10TH
          25TH              154.          39.         14.         62.        11.5        .012       8.000       .0353
   MEDIAN 50TH              170.          44.         16.         67.        11.8        .014       8.500       .0363
          75TH              200.          52.         17.         72.        13.0        .015       9.625       .0393
          90TH
SECONDARY CODE

                             07021L      07562L      07205L      07105L      07906L      97160S
                            NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    DISCHARGE
                             TOTAL      DISSOLVED   DISSOLVED   DISSOLVED   PARTICULATE  INSTANT
                            KJELDAHL    AMMONIA      NITRITE    NO3 & NO2    TOTAL
                     SUBM      N           N           N           N           N
                      ID     MG/L        MG/L        MG/L        MG/L        MG/L        M3/S
SAMPLES(FLAGS)               8(0)        8(0)        8(7)        8(7)        8(0)        8(0)
           LOW             36.500      27.000      L.05        L.050        1.15       .0284
          HIGH             47.500      37.950       .17         .17         6.40       .0407
       AVERAGE             41.187      32.856       .065*       .065*       3.45       .0364
      STD.DEV.              3.916       4.307       .042*       .042*       1.81       .0038
   PERCNT:10TH
          25TH             37.750      29.500      L.050       L.050        1.98       .0353
   MEDIAN 50TH             41.100      32.450      L.050       L.050        3.35       .0363
          75TH             43.900      37.000      L.050       L.050        4.70       .0393
          90TH
SECONDARY CODE

                             10407L      10474L      10453L      00205L      36011L      36001L      36102L      36910L
                            RESIDUE     RESIDUE     RESIDUE      TOTAL      COLIFORMS   COLIFORMS    STREP.     STD. PLATE
                          NONFILTRABLE   TOTAL      FILTRABLE   DISSOLVED    FECAL       TOTAL       FECAL        COUNT
                                                                 SOLIDS                                         BACT.DENS.
                     SUBM                                                    MPN         MPN          MF
                      ID     MG/L        MG/L        MG/L        MG/L      NO/100ML    NO/100ML    NO/100ML      NO/ML
SAMPLES(FLAGS)                                                   8(0)        8(0)        8(2)        8(0)        8(0)
           LOW                                                   415.      10000.      12000.       3000.      12000.
          HIGH                                                  1164.      56000.      99999.      32000.      98000.
       AVERAGE                                                   557.      35750.      77625.*     14738.      49000.
      STD.DEV.                                                   253.      16816.      33444.*      8935.      34744.
   PERCNT:10TH
          25TH                                                   440.      24000.      59000.       8950.      18000.
   MEDIAN 50TH                                                   461.      33500.      95500.      13000.      44000.
          75TH                                                   540.      52500.      99999.      19500.      79000.
          90TH
SECONDARY CODE
```

```
REQUEST 0007 -  0009 PAGE  15                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 21AL05EB4000    LAT. 53D 44M 50S  LONG. 113D 11M 45S   PR 3   UTM 12 355200E 5957400N  FOR MAY 18, 1983 TO SEP 21, 1983
FT.SASKATCHEWAN SEWAGE LAGOONS              FINAL EFFLUENT GRAB

                          29009L      30009L      26304L      13306L      25003L      28009L      42009L      27009L
                          COPPER       ZINC        IRON      ALUMINUM    MANGANESE    NICKEL    MOLYBDENUM    COBALT
                           TOTAL       TOTAL      EXTRBLE.    EXTRBLE.     TOTAL       TOTAL       TOTAL       TOTAL

                  SUBM      CU          ZN          FE          AL          MN          NI          MO          CO
                   ID      MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)             8(0)        8(0)        8(0)        8(0)        8(0)        8(0)        8(1)        8(1)
           LOW             .023        .041        1.42        .431        .072        .011       L.001       L.001
          HIGH             .919        .090       31.50       1.000        .368        .327        .158        .044
       AVERAGE             .275        .063       10.81        .574        .172        .098        .045*       .013*
      STD.DEV.             .327        .020       12.51        .182        .118        .119        .063*       .014*
   PERCNT:10TH
          25TH             .065        .044        2.91        .478        .086        .023        .009        .005
   MEDIAN 50TH             .150        .063        3.68        .511        .111        .047        .013        .008
          75TH             .414        .080       20.18        .590        .270        .154        .078        .018
          90TH
SECONDARY CODE

                          33005L      04304L      48009L      24009L      82302L      80015L      34005L      23009L
                          ARSENIC    BERYLLIUM    CADMIUM    CHROMIUM      LEAD      MERCURY     SELENIUM    VANADIUM
                          TOTAL       EXTRBLE.     TOTAL       TOTAL      EXTRBLE.     TOTAL      TOTAL        TOTAL

                  SUBM      AS          BE          CD          CR          PB          HG          SE          V
                   ID      MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)             8(0)        8(8)        8(3)        8(0)        8(0)        8(8)        8(6)        8(1)
           LOW            .0017       L.001       L.001        .005        .005      L.0001      L.0002       L.002
          HIGH            .0900       L.001        .003        .184        .025      L.0001       .0006        .080
       AVERAGE            .0265                    .002*       .061        .013                   .0003*       .025*
      STD.DEV.            .0351                    .001*       .074        .008                   .0001*       .031*
   PERCNT:10TH
          25TH            .0050       L.001       L.001        .014        .008      L.0001      L.0002        .005
   MEDIAN 50TH            .0107       L.001        .002        .024        .011      L.0001      L.0002        .009
          75TH            .0443       L.001        .002        .112        .019      L.0001       .0002*       .044
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

SECTION 3

NAQUADAT Summary Reports for analyses of final effluent grab samples from industries licensed to discharge wastewater into the study section of the North Saskatchewan river.

REQUEST 0001 - 0003 PAGE 1

NAQUADAT SUMMARY REPORT JAN 08, 1986
INDUSTRIAL MONITORING

STATION 20AL05EB0500 LAT. 53D 32M 2S LONG. 113D 23M 32S PR 3 UTM 12 341450E 5934100N FOR APR 29, 1980 TO APR 12, 1984
THE STEEL COMPANY OF CANADA LTD EDM FINAL EFFLUENT GRAB
NW30/SW31 T52 R23 W4M

	02061F TEMPERATURE OF WATER	10301L PH	10301F PH	10151L ALKALINITY PHENOL PHTHALEIN	10101L ALKALINITY TOTAL	02041L SPECIFIC CONDUCT.	97160S DISCHARGE INSTANT	97163S DISCHARGE DAILY MEAN
SUBM				CACO3	CACO3			
ID	DEG.C	PH UNITS	PH UNITS	MG/L	MG/L	US/CM	M3/S	CFS
SAMPLES(FLAGS)	16(0)	16(0)	2(0)	16(1)	16(0)	16(0)		15(0)
LOW	2.0	7.19	7.9	.0	74.	597.		.008
HIGH	21.0	8.4	8.3	4.2	230.	1115.		2.67
AVERAGE	12.4			.3*	143.7	946.		.8439
STD.DEV.	6.4			1.0*	42.0	155.		.6395
PERCNT:10TH	3.0	7.3		.0	82.	730.		.22
25TH	8.0	7.55		.0	120.0	835.		.52
MEDIAN 50TH	11.5	7.90	8.10	.0	133.5	1005.		.66
75TH	18.0	8.00		.0	173.5	1054.		1.31
90TH	20.0	8.0		L.5	194.	1096.		1.43
SECONDARY CODE								

	06201L BICARBONT. (CALCD.)	06202L BICARBONT. (CALCD.)	06301L CARBONATE (CALCD.)	20103L CALCIUM DISSOLVED	20105L CALCIUM DISSOLVED (CALCD.)	10602L HARDNESS TOTAL (CALCD.)	10604L HARDNESS TOTAL	97160S DISCHARGE INSTANT
SUBM	HCO3	HCO3	CO3	CA	CA	CACO3	CACO3	
ID	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	M3/S
SAMPLES(FLAGS)	16(1)	4(0)	16(1)	15(0)	2(0)	11(0)	5(0)	
LOW	90.	145.	0.	55.	63.9	201.6	271.	
HIGH	280.	221.	5.	93.	63.9	356.2	405.	
AVERAGE	174.*	176.	0.*	68.7	63.9	258.4	321.6	
STD.DEV.	52.*	36.	1.*	12.7	.0	53.7	65.8	
PERCNT:10TH	100.		0.	56.		203.2		
25TH	142.	147.	0.	57.		216.4	271.3	
MEDIAN 50TH	163.	169.	0.	64.0	63.9	240.4	279.8	
75TH	211.	205.	0.	80.0		300.8	381.	
90TH	236.		Q1.	91.		342.2		
SECONDARY CODE				11L 10L				

	11103L SODIUM DISSOLVED	12102L MAGNESIUM DISSOLVED	19103L POTASSIUM DISSOLVED	09107L FLUORIDE DISSOLVED	17203L CHLORIDE DISSOLVED	16306L SULPHATE DISSOLVED	26009L IRON TOTAL	26304L IRON EXTRBLE.
SUBM	NA	MG	K	F	CL	SO4	FE	FE
ID	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
SAMPLES(FLAGS)	16(0)	16(0)	16(0)	16(0)	16(0)	16(0)	4(1)	12(0)
LOW	21.	15.	3.7	.39	16.	120.	L.01	.07
HIGH	118.8	42.	40.0	2.0	108.5	355.0	.48	.55
AVERAGE	79.0	26.1	20.01	1.122	68.59	246.0	.200*	.226
STD.DEV.	29.1	8.1	11.82	.375	28.29	62.5	.201*	.138
PERCNT:10TH	41.	16.	4.4	.57	26.	175.		.08
25TH	58.5	20.5	10.15	.940	44.00	195.0	.065*	.110
MEDIAN 50TH	76.8	23.5	18.50	1.135	72.00	250.0	.155	.215
75TH	104.5	32.0	29.00	1.335	91.50	292.4	.335	.295
90TH	115.	38.0	39.5	1.47	104.	314.9		.35
SECONDARY CODE	11L	11L	11L	06L				

* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q

```
REQUEST 0004 -  0006 PAGE   2                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB0500    LAT. 53D 32M  2S  LONG. 113D 23M 32S   PR 3   UTM 12 341450E 5934100N  FOR APR 29, 1980 TO APR 12, 1984
THE STEEL COMPANY OF CANADA LTD EDM       FINAL EFFLUENT GRAB
NW30/SW31 T52 R23 W4M

                          07105L      07205L      07562L      07021L      07906L       07905L      15421L      97160S
                         NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN     NITROGEN   PHOSPHORUS   DISCHARGE
                        DISSOLVED   DISSOLVED   DISSOLVED     TOTAL    PARTICULATE  PARTICULATE    TOTAL       INSTANT
                         NO3 & NO2   NITRITE     AMMONIA    KJELDAHL     TOTAL       (CALCD.)
                  SUBM      N           N           N           N           N            N           P
                   ID     MG/L        MG/L        MG/L        MG/L        MG/L         MG/L        MG/L        M3/S
SAMPLES(FLAGS)            16(12)      15(13)      16(2)       16(0)       10(2)                    16(0)
           LOW            L.003       L.02         .014        .850       L.01                      .02
          HIGH             .15         .08        1.10        2.150        .950                     .310
       AVERAGE             .061*       .049*       .326*      1.441        .321*                    .117
      STD.DEV.             .041*       .015*       .319*       .410        .334*                    .065
   PERCNT:10TH            L.02        L.02         .027        .910       L.010                     .061
          25TH            L.050       L.05        L.050       1.025        .03                      .088
   MEDIAN 50TH            L.050       L.05         .239       1.520        .260                     .100
          75TH             .060*      L.05         .558       1.775        .45                      .125
          90TH             .14         .07         .67        1.889        .875                     .185
SECONDARY CODE                                    61L         15L                              19L 06L

                          10474L      10407L      10511L      10453L      14101L       97160S      97163S
                         RESIDUE     RESIDUE     RESIDUE     RESIDUE     SILICA      DISCHARGE   DISCHARGE
                          TOTAL    NONFILTRABLE  VOLATILE   FILTRABLE   REACTIVE      INSTANT      DAILY
                                                NONFILTR.                                          MEAN
                  SUBM                          (CALCD.)                  SIO2
                   ID     MG/L        MG/L        MG/L        MG/L        MG/L         M3/S         CFS
SAMPLES(FLAGS)            15(0)       16(0)       1(1)        11(0)       16(0)                     15(0)
           LOW            469.         1.          Q.4        460.         4.3                      .008
          HIGH            974.        23.          Q.4        870.        10.7                     2.67
       AVERAGE            725.9       10.4                    688.6        7.42                     .8439
      STD.DEV.            135.8        5.0                    135.0        2.00                     .6395
   PERCNT:10TH            487.         7.                     480.         4.4                      .22
          25TH            650.0        8.0                    570.         6.05                     .52
   MEDIAN 50TH            761.         9.0                    735.         7.10                     .66
          75TH            788.        11.5                    780.         9.25                    1.31
          90TH            877.        18.                     820.        10.4                     1.43
SECONDARY CODE            71L         01L                     51L         02L

                          00205L      02074L      06537L      06524L      02001L       16101L      10701L      06608L
                          TOTAL     TURBIDITY    PHENOLIC     OIL AND     ODOUR       SULPHIDE    SURFACT.     CYANIDE
                        DISSOLVED                MATERIAL     GREASE    THRESHOLD    DISSOLVED    N-ALKYL
                          SOLIDS                                          NUMBER                 SULPHNTS.
                  SUBM                           PHENOL                                  S          LAS          CN
                   ID     MG/L        NTU         MG/L        MG/L         TON          MG/L        MG/L        MG/L
SAMPLES(FLAGS)            15(0)       14(1)       16(0)       16(0)        7(0)                    14(1)        4(3)
           LOW            339.        L.1          .005         .3          1.                     L.01        L.002
          HIGH            964.        32.0         .023       13.6         10.                     1.44        L.02
       AVERAGE            611.7        7.2*        .013        2.731        4.                      .425*      .0080*
      STD.DEV.            160.2        8.5*        .005        3.510        4.                      .478*      .0085*
   PERCNT:10TH            434.         1.0         .006         .5                                  .02
          25TH            459.         2.0         .009         .550        1.                      .15        L.0020
   MEDIAN 50TH            627.         3.8         .013        1.100        1.                      .220        .0050*
          75TH            710.        13.0         .016        3.850       10.                      .40         .0140*
          90TH            786.0       14.0         .021        6.                                  1.43
SECONDARY CODE                                                21L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

NAQUADAT SUMMARY REPORT JAN 08, 1986
INDUSTRIAL MONITORING

STATION 20AL05EB0500 LAT. 53D 32M 2S LONG. 113D 23M 32S PR 3 UTM 12 341450E 5934100N FOR APR 29, 1980 TO APR 12, 1984
THE STEEL COMPANY OF CANADA LTD EDM FINAL EFFLUENT GRAB
NW30/SW31 T52 R23 W4M

SUBM ID	08304L OXYGEN TOTAL COD 02 MG/L	08202L OXYGEN BIOCHEM. DEMAND-BOD 02 MG/L	06107L CARBON DISSOLVED ORGANIC C MG/L	06154L CARBON DISSOLVED INORGANIC C MG/L	06001L CARBON TOTAL ORGANIC C MG/L	06051L CARBON TOTAL INORGANIC C MG/L	06006L CARBON TOTAL C MG/L	06905L CARBON PARTICULATE TOTAL C MG/L
SAMPLES(FLAGS)	16(0)	4(0)	11(0)	10(0)	6(0)	2(0)	1(0)	10(1)
LOW	25.1	3.4	5.6	14.	7.	21.0	31.	L.01
HIGH	173.	13.4	21.0	53.8	41.1	24.	31.	4.86
AVERAGE	70.3	8.92	15.31	33.87	19.38	22.50		2.37*
STD.DEV.	40.0	4.29	5.33	12.54	11.68	2.12		1.55*
PERCNT:10TH	38.0		9.5	15.00				.36*
25TH	41.1	5.70	10.	28.0	14.5			1.34
MEDIAN 50TH	62.5	9.45	18.	34.50	15.85	22.50		2.14
75TH	81.5	12.15	19.4	42.0	22.0			3.41
90TH	149.		21.0	49.90				4.62
SECONDARY CODE	01L		01L		05L 07L	52L		

SUBM ID	24101L CHROMIUM HEXAVALENT CR MG/L	24009L CHROMIUM TOTAL CR MG/L	24302L CHROMIUM EXTRBLE. CR MG/L	80015L MERCURY TOTAL HG MG/L	80011L MERCURY TOTAL HG UG/L	27009L COBALT TOTAL CO MG/L	27302L COBALT EXTRBLE. CO MG/L	47304L SILVER EXTRBLE. AG MG/L
SAMPLES(FLAGS)	14(14)	15(5)		14(12)	2(2)	15(12)	1(1)	4(4)
LOW	L.001	L.001		L.0001	L.02	L.001	L.001	L.02
HIGH	L.01	.014		.0013	L.02	L.01	L.001	L.02
AVERAGE		.008*		.0002*		.004*		
STD.DEV.		.003*		.0003*		.004*		
PERCNT:10TH	L.001	.005		L.0001		L.001		
25TH	L.001	.006		L.0001		L.001		L.020
MEDIAN 50TH	L.001	L.01		L.0001	L.020	L.001		L.020
75TH	L.01	.010		L.0001		L.01		L.020
90TH	L.01	.012		.0005		L.01		
SECONDARY CODE								

SUBM ID	29009L COPPER TOTAL CU MG/L	29305L COPPER EXTRBLE. CU MG/L	28009L NICKEL TOTAL NI MG/L	28302L NICKEL EXTRBLE. NI MG/L	48009L CADMIUM TOTAL CD MG/L	48302L CADMIUM EXTRBLE. CD MG/L	82009L LEAD TOTAL PB MG/L	82302L LEAD EXTRBLE. PB MG/L
SAMPLES(FLAGS)	15(3)	1(0)	15(3)	1(0)	14(13)	1(1)	6(2)	10(6)
LOW	.002	.004	.010	.014	L.001	L.001	L.003	L.002
HIGH	.014	.004	.031	.014	L.01	L.001	.017	L.02
AVERAGE	.008*		.017*		.004*		.007*	.012*
STD.DEV.	.004*		.005*		.004*		.006*	.008*
PERCNT:10TH	.003		.011		L.001			L.002
25TH	L.005		.013		L.001		L.003	.005
MEDIAN 50TH	.006		.016		L.001		.005	.011
75TH	.011		L.02		L.01		.010	L.02
90TH	.013		.020		L.01			L.020
SECONDARY CODE								

* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q

```
REQUEST 0010 -  0012 PAGE   4                     NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB0500    LAT. 53D 32M  2S  LONG. 113D 23M 32S   PR 3   UTM 12 341450E 5934100N  FOR APR 29, 1980 TO APR 12, 1984
THE STEEL COMPANY OF CANADA LTD EDM       FINAL EFFLUENT GRAB
NW30/SW31 T52 R23 W4M

                          30009L     30305L     25003L     25304L     23009L     42304L     42009L     51003L
                           ZINC       ZINC     MANGANESE  MANGANESE  VANADIUM  MOLYBDENUM MOLYBDENUM  ANTIMONY
                          TOTAL     EXTRBLE.    TOTAL     EXTRBLE.    TOTAL     EXTRBLE.    TOTAL      TOTAL

                  SUBM     ZN         ZN         MN         MN          V          MO         MO         SB
                   ID     MG/L       MG/L       MG/L       MG/L       MG/L       MG/L       MG/L       MG/L
SAMPLES(FLAGS)           15(1)       1(0)      15(0)       1(0)      14(4)                 12(0)       4(2)
           LOW             .009       .017       .064       .260       .003                  .03      L.001
          HIGH             .059       .017       .478       .260       .011                  .123      .012
       AVERAGE             .028*                 .205                  .008*                 .074      .0060*
      STD.DEV.             .014*                 .111                  .003*                 .035      .0058*
  PERCNT:10TH              .011                  .072                  .005                  .037
          25TH             .017                  .109                  .005                  .041     L.0010
   MEDIAN 50TH             .026                  .182                  .007                  .062      .0055*
          75TH             .04                   .282                 L.01                   .107      .0110
          90TH             .048                  .313                  .011                  .122
SECONDARY CODE                                                        02L

                          33005L     33104L     34005L     34102L     13111L     13306L     04102L     04304L
                          ARSENIC    ARSENIC    SELENIUM   SELENIUM   ALUMINUM   ALUMINUM  BERYLLIUM  BERYLLIUM
                          TOTAL     DISSOLVED   TOTAL     DISSOLVED  DISSOLVED   EXTRBLE.  DISSOLVED   EXTRBLE.

                  SUBM     AS         AS         SE         SE         AL         AL         BE         BE
                   ID     MG/L       MG/L       MG/L       MG/L       UG/L       MG/L       MG/L       MG/L
SAMPLES(FLAGS)            6(2)       1(0)       6(3)       1(0)       4(0)      10(1)       4(4)      10(9)
           LOW           L.001       .0022     L.0002      .0005     100.        L.020      L.005      L.001
          HIGH            .020       .0022      .019       .0005     310.         .284      L.005       .003
       AVERAGE            .0059*                .0044*               165.00       .129*                 .001*
      STD.DEV.            .0072*                .0074*                99.50       .092*                 .001*
  PERCNT:10TH                                                                     .032*                L.001
          25TH           L.001                  .0004                100.00       .060      L.005      L.001
   MEDIAN 50TH            .0037                L.0010                125.00       .089      L.005      L.001
          75TH            .006                  .0048                230.00       .21       L.005      L.001
          90TH                                                                    .261                  .002*
SECONDARY CODE                                 07L                               02L                   02L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE   5                   NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                 INDUSTRIAL MONITORING
STATION 20AL05EB0501    LAT. 53D 32M  2S  LONG. 113D 23M 32S   PR 3   UTM 12 341450E 5934100N  FOR MAY 05, 1981 TO AUG 16, 1983
THE STEEL COMPANY OF CANADA LTD EDM       FINAL EFFLUENT COMP
NW30/SW31 T52 R23 W4M

                          02061F       10301L       10301F       10151L       10101L       02041L       97160S       97163S
                        TEMPERATURE      PH           PH       ALKALINITY   ALKALINITY   SPECIFIC    DISCHARGE    DISCHARGE
                        OF WATER                                 PHENOL       TOTAL      CONDUCT.     INSTANT       DAILY
                                                               PHTHALEIN                                            MEAN
                   SUBM                                          CACO3        CACO3
                    ID    DEG.C       PH UNITS     PH UNITS      MG/L         MG/L        US/CM        M3/S          CFS
SAMPLES(FLAGS)                          4(0)         1(0)        4(0)         4(0)        4(0)                      4(0)
           LOW                          7.20         8.1           .0          75.        980.                       .52
          HIGH                          8.1          8.1           .0         231.       1090.                      1.35
       AVERAGE                                                     .0         137.8      1036.                       .9500
      STD.DEV.                                                     .0          66.1        45.                       .4410
   PERCNT:10TH
          25TH                          7.20                       .0          97.5      1005.                       .5700
   MEDIAN 50TH                          7.25                       .0         122.5      1036.                       .9650
          75TH                          7.70                       .0         178.0      1066.                      1.3300
          90TH
SECONDARY CODE

                          06201L       06202L       06301L       20103L       20105L       10602L       10604L       97160S
                        BICARBONT.   BICARBONT.   CARBONATE     CALCIUM      CALCIUM     HARDNESS     HARDNESS     DISCHARGE
                         (CALCD.)     (CALCD.)     (CALCD.)    DISSOLVED    DISSOLVED      TOTAL        TOTAL       INSTANT
                                                                             (CALCD.)    (CALCD.)
                   SUBM   HCO3         HCO3         CO3          CA           CA          CACO3        CACO3
                    ID   MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         M3/S
SAMPLES(FLAGS)            4(0)         1(0)         4(0)         4(0)                     2(0)         2(0)
           LOW             91.         147.           0.          53.                     198.2        268.2
          HIGH            282.         147.           0.          95.                     215.6        425.
       AVERAGE            168.                        0.          68.6                    206.9        346.6
      STD.DEV.             81.                        0.          19.4                     12.3        110.9
   PERCNT:10TH
          25TH            119.                        0.          54.0
   MEDIAN 50TH            149.                        0.          63.1                    206.9        346.6
          75TH            217.                        0.          83.1
          90TH
SECONDARY CODE                                     11L 10L

                          11103L       12102L       19103L       09107L       17203L       16306L       26009L       26304L
                          SODIUM     MAGNESIUM    POTASSIUM     FLUORIDE     CHLORIDE     SULPHATE      IRON         IRON
                        DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED      TOTAL      EXTRBLE.

                   SUBM    NA           MG           K            F            CL           SO4          FE           FE
                    ID    MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)            4(0)         4(0)         4(0)         4(0)         4(0)         4(0)         2(0)         2(0)
           LOW             99.          16.          18.           .50         21.         240.           .15          .08
          HIGH            119.5         46.          39.0         1.6         105.5        312.8          .16          .22
       AVERAGE            109.1         25.7         29.07        1.067        79.13       278.7          .155         .150
      STD.DEV.              8.4         13.7          8.81         .465        39.28        29.8          .007         .099
   PERCNT:10TH
          25TH            103.5         17.5         22.65         .720        55.50       260.0
   MEDIAN 50TH            109.0         20.4         29.65        1.085        95.00       281.0          .155         .150
          75TH            114.8         33.9         35.50        1.415       102.75       297.4
          90TH
SECONDARY CODE            11L          11L          11L          06L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE   6                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB0501    LAT. 53D 32M  25  LONG. 113D 23M 32S   PR 3   UTM 12 341450E 5934100N  FOR MAY 05, 1981 TO AUG 16, 1983
THE STEEL COMPANY OF CANADA LTD EDM       FINAL EFFLUENT COMP
NW30/SW31 T52 R23 W4M

                          07105L      07205L      07562L      07021L      07906L      07905L      15421L      97160S
                         NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN   PHOSPHORUS  DISCHARGE
                         DISSOLVED   DISSOLVED   DISSOLVED    TOTAL    PARTICULATE PARTICULATE   TOTAL      INSTANT
                         NO3 & NO2    NITRITE    AMMONIA     KJELDAHL     TOTAL     (CALCD.)
                  SUBM       N           N           N           N           N           N           P
                   ID      MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        M3/S
SAMPLES(FLAGS)             4(3)        4(3)        4(1)        4(0)        2(0)                    4(0)
           LOW             L.02        L.02        L.05         .90         .39                    .060
          HIGH              .14         .06        .468       1.900         .46                     .16
       AVERAGE             .065*       .045*       .256*      1.400        .425                    .110
      STD.DEV.             .052*       .017*       .235*       .523        .049                    .041
  PERCNT:10TH
          25TH            L.035       L.035        .052*       .950                                .084
   MEDIAN 50TH            L.050       L.050        .252       1.400        .425                    .109
          75TH             .095*       .055*       .459       1.850                                .135
          90TH
SECONDARY CODE                                     61L         15L                                 19L

                          10474L      10407L      10511L      10453L      14101L      97160S      97163S
                         RESIDUE     RESIDUE     RESIDUE     RESIDUE      SILICA    DISCHARGE   DISCHARGE
                          TOTAL    NONFILTRABLE  VOLATILE   FILTRABLE   REACTIVE     INSTANT      DAILY
                                                NONFILTR.                                         MEAN
                  SUBM                          (CALCD.)                  SIO2
                   ID    MG/L        MG/L        MG/L        MG/L        MG/L        M3/S        CFS
SAMPLES(FLAGS)            4(0)        4(0)                    2(0)        4(0)                    4(0)
           LOW            720.          2.                    710.        5.17                     .52
          HIGH            874.         14.                    870.        10.3                    1.35
       AVERAGE            776.5         7.5                   790.0       7.47                    .9500
      STD.DEV.             69.5         5.5                   113.1       2.12                    .4410
  PERCNT:10TH
          25TH            727.0         3.0                               6.08                    .5700
   MEDIAN 50TH            756.0         7.0                   790.0       7.20                    .9650
          75TH            826.0        12.0                               8.85                   1.3300
          90TH
SECONDARY CODE             71L         01L                                02L

                          00205L      02074L      06537L      06524L      02001L      16101L      10701L      06608L
                          TOTAL     TURBIDITY    PHENOLIC    OIL AND      ODOUR     SULPHIDE    SURFACT.     CYANIDE
                         DISSOLVED               MATERIAL    GREASE     THRESHOLD   DISSOLVED   N-ALKYL
                          SOLIDS                                          NUMBER                SULPHNTS.
                  SUBM                           PHENOL                                 S          LAS          CN
                   ID      MG/L        NTU         MG/L        MG/L        TON         MG/L        MG/L        MG/L
SAMPLES(FLAGS)             4(0)        4(0)        4(0)        4(0)        2(0)                    4(1)
           LOW             626.         2.0        .010         1.4          2.                    L.01
          HIGH             776.0       23.0        .019          9.         10.                    1.41
       AVERAGE             687.8       10.1        .014       4.500          6.                    .505*
      STD.DEV.              70.9        9.6        .004       3.494          6.                    .626*
  PERCNT:10TH
          25TH             630.5        2.8        .011       1.750                                .095*
   MEDIAN 50TH             674.5        7.8        .013       3.800          6.                    .300
          75TH             745.0       17.5        .017       7.250                                .915
          90TH
SECONDARY CODE                                                  21L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE   7                  NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                 INDUSTRIAL MONITORING
STATION 20AL05EB0501    LAT. 53D 32M  2S  LONG. 113D 23M 32S   PR 3   UTM 12 341450E 5934100N  FOR MAY 05, 1981 TO AUG 16, 1983
THE STEEL COMPANY OF CANADA LTD EDM        FINAL EFFLUENT COMP
NW30/SW31 T52 R23 W4M
                         08304L      08202L      06107L      06154L      06001L      06051L      06006L      06905L
                         OXYGEN      OXYGEN      CARBON      CARBON      CARBON      CARBON      CARBON      CARBON
                          TOTAL     BIOCHEM.    DISSOLVED   DISSOLVED    TOTAL       TOTAL      TOTAL      PARTICULATE
                           COD     DEMAND-BOD   ORGANIC    INORGANIC    ORGANIC    INORGANIC                 TOTAL
                 SUBM     02           02        C           C           C           C           C           C
                  ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            4(0)                    2(0)        2(0)        2(0)                                2(0)
           LOW            42.                     19.         14.         13.4                                 2.24
          HIGH            157.                    21.0        28.0        19.4                                 2.89
       AVERAGE             88.8                   20.00       21.00       16.40                                2.57
      STD.DEV.             48.7                    1.41        9.90        4.24                                 .46
   PERCNT:10TH
          25TH             57.5
   MEDIAN 50TH             78.0                   20.00       21.00       16.40                                2.57
          75TH            120.0
          90TH
SECONDARY CODE           01L                                              07L
                         24101L      24009L      24302L      80015L      80011L      27009L      27302L      47304L
                        CHROMIUM    CHROMIUM    CHROMIUM    MERCURY     MERCURY     COBALT      COBALT      SILVER
                       HEXAVALENT    TOTAL      EXTRBLE.    TOTAL       TOTAL       TOTAL      EXTRBLE.    EXTRBLE.

                 SUBM      CR          CR          CR         HG          HG          CO          CO          AG
                  ID     MG/L        MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            4(4)        3(0)                    2(2)        1(1)        3(2)                    1(1)
           LOW            L.001        .003                   L.0001      L.02        L.001                   L.02
          HIGH            L.01         .010                   L.0001      L.02        L.01                    L.02
       AVERAGE                         .008                                            .005*
      STD.DEV.                         .004                                            .005*
   PERCNT:10TH
          25TH            L.001
   MEDIAN 50TH            L.005        .01                    L.0001                   .003
          75TH            L.010
          90TH
SECONDARY CODE
                         29009L      29305L      28009L      28302L      48009L      48302L      82009L      82302L
                         COPPER      COPPER      NICKEL      NICKEL      CADMIUM     CADMIUM     LEAD        LEAD
                          TOTAL     EXTRBLE.     TOTAL      EXTRBLE.     TOTAL      EXTRBLE.     TOTAL      EXTRBLE.

                 SUBM      CU          CU          NI          NI          CD          CD          PB          PB
                  ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            3(1)                    3(1)                    3(3)                    1(0)        2(1)
           LOW             .016                   L.005                   L.001                    .006        .006
          HIGH             .021                    .020                   L.01                     .006       L.02
       AVERAGE             .019*                   .012*                                                       .013*
      STD.DEV.             .003*                   .008*                                                       .010*
   PERCNT:10TH
          25TH
   MEDIAN 50TH            L.02                     .012                   L.001                                .013*
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0010 -  0012 PAGE   8                      NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                    INDUSTRIAL MONITORING
STATION 20AL05EB0501    LAT. 53D 32M  2S  LONG. 113D 23M 32S   PR 3   UTM 12 341450E 5934100N  FOR MAY 05, 1981 TO AUG 16, 1983
THE STEEL COMPANY OF CANADA LTD EDM       FINAL EFFLUENT COMP
NW30/SW31 T52 R23 W4M

                            30009L        30305L        25003L        25304L        23009L        42304L        42009L        51003L
                             ZINC          ZINC        MANGANESE     MANGANESE     VANADIUM     MOLYBDENUM    MOLYBDENUM     ANTIMONY
                            TOTAL        EXTRBLE.        TOTAL        EXTRBLE.       TOTAL        EXTRBLE.       TOTAL         TOTAL

                    SUBM     ZN            ZN            MN            MN            V             MO            MO            SB
                     ID     MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)              3(0)                        3(0)                        3(1)                        3(0)          1(0)
           LOW               .04                         .061                        .004                        .04           .023
          HIGH               .061                        .283                        .011                        .112          .023
       AVERAGE               .050                        .169                        .008*                       .086
      STD.DEV.               .011                        .111                        .004*                       .040
   PERCNT:10TH
          25TH
   MEDIAN 50TH               .048                        .163                        L.01                        .106
          75TH
          90TH
SECONDARY CODE

                            33005L        33104L        34005L        34102L        13111L        13306L        04102L        04304L
                            ARSENIC       ARSENIC      SELENIUM      SELENIUM      ALUMINUM      ALUMINUM     BERYLLIUM     BERYLLIUM
                            TOTAL        DISSOLVED     TOTAL         DISSOLVED     DISSOLVED     EXTRBLE.     DISSOLVED      EXTRBLE.

                    SUBM     AS            AS            SE            SE            AL            AL            BE            BE
                     ID     MG/L          MG/L          MG/L          MG/L          UG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)              1(0)                        1(0)                        1(0)          2(0)          1(1)          2(2)
           LOW              .011                        .002                        30.            .055         L.005         L.001
          HIGH              .011                        .002                        30.            .158         L.005         L.001
       AVERAGE                                                                                     .107
      STD.DEV.                                                                                     .073
   PERCNT:10TH
          25TH
   MEDIAN 50TH                                                                                     .107                       L.001
          75TH
          90TH
SECONDARY CODE                                          07L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE   9                     NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB0800    LAT. 53D 32M 28S  LONG. 113D 24M 37S   PR 3   UTM 12 340300E 5934950N  FOR MAR 12, 1981 TO JUL 25, 1984
CANADIAN INDUSTRIES LTD EDMONTON          FINAL EFFLUENT GRAB
NW S36 T52 R24 W4M

                       02061F        10301L        10301F        10151L        10101L        02041L        97160S        97163S
                    TEMPERATURE         PH           PH         ALKALINITY    ALKALINITY     SPECIFIC     DISCHARGE      DISCHARGE
                    OF WATER                                     PHENOL         TOTAL       CONDUCT.       INSTANT         DAILY
                                                                PHTHALEIN                                                MEAN
               SUBM                                               CACO3         CACO3
                ID     DEG.C        PH UNITS      PH UNITS          MG/L        MG/L          US/CM         M3/S          CFS
SAMPLES(FLAGS)            7(0)         10(0)                        9(1)         10(0)         10(0)                       10(0)
           LOW            14.0           7.0                          .0          60.4          252.                         .03
          HIGH            32.0           8.3                         L.1         127.           557.                         .29
       AVERAGE            25.0                                        .0*         90.7          374.                       .1860
      STD.DEV.             5.9                                        .0*         27.3           90.                       .0699
   PERCNT:10TH                          7.21                                      61.9          262.                       .0950
          25TH            22.0           7.8                          .0          67.0          336.                         .16
   MEDIAN 50TH            26.0          7.90                          .0          86.0          353.                       .1785
          75TH            29.0          8.00                          .0         121.           413.                        .236
          90TH                          8.20                                     126.0          513.                       .2680
SECONDARY CODE

                       06201L        06202L        06301L        20103L        20105L        10602L        10604L        97160S
                     BICARBONT.    BICARBONT.     CARBONATE      CALCIUM       CALCIUM       HARDNESS     HARDNESS     DISCHARGE
                       (CALCD.)     (CALCD.)      (CALCD.)      DISSOLVED     DISSOLVED       TOTAL         TOTAL        INSTANT
                                                                              (CALCD.)      (CALCD.)
               SUBM    HCO3           HCO3           CO3            CA           CA           CACO3         CACO3
                ID   MG/L             MG/L         MG/L           MG/L          MG/L          MG/L          MG/L          M3/S
SAMPLES(FLAGS)            9(1)          3(0)          9(1)         10(0)          1(0)          8(0)          3(0)
           LOW            74.           77.            0.           23.0          40.8         113.6          88.0
          HIGH           155.           89.           Q0.           60.           40.8         203.3         172.0
       AVERAGE           114.*          83.            0.*          40.8                       159.1         127.6
      STD.DEV.            33.*           6.            0.*          10.6                        25.8          42.2
   PERCNT:10TH                                                      26.0
          25TH            83.                          0.           36.0                       146.7
   MEDIAN 50TH           121.           83.            0.           40.0                       160.6         122.8
          75TH           147.                          0.           48.                        170.8
          90TH                                                      55.0
SECONDARY CODE                                               11L 10L

                      11103L         12102L        19103L        09107L       17203L        16306L        26009L        26304L
                       SODIUM      MAGNESIUM     POTASSIUM      FLUORIDE      CHLORIDE       SULPHATE      IRON           IRON
                      DISSOLVED    DISSOLVED     DISSOLVED      DISSOLVED     DISSOLVED     DISSOLVED     TOTAL          EXTRBLE.

               SUBM      NA            MG             K            F             CL           SO4            FE            FE
                ID      MG/L          MG/L          MG/L          MG/L         MG/L           MG/L          MG/L          MG/L
SAMPLES(FLAGS)           10(0)         10(0)         10(0)         10(0)         10(0)         10(0)          2(0)          7(0)
           LOW             6.           7.3            .9           .47           5.           40.            .06           .04
          HIGH            42.0          17.0          21.0          1.80         27.00         154.0          2.22           .47
       AVERAGE            12.4          11.3          3.28         1.023          9.32          75.6         1.140          .187
      STD.DEV.            11.5           2.9          6.23          .431          7.35          34.2         1.527          .150
   PERCNT:10TH             6.0           7.7           .90          .605          5.00          44.3
          25TH             6.0           9.           1.00           .80           5.           50.                          .11
   MEDIAN 50TH             7.5          11.5          1.45          .915          6.40          67.3         1.140          .130
          75TH            11.           13.            1.5          1.00           8.           90.                          .31
          90TH            32.0          15.3         11.45         1.790         22.50         127.0
SECONDARY CODE         11L           11L           11L       06L 05L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  10                      NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                    INDUSTRIAL MONITORING
STATION 20AL05EB0800    LAT. 53D 32M 28S  LONG. 113D 24M 37S   PR 3   UTM 12 340300E 5934950N  FOR MAR 12, 1981 TO JUL 25, 1984
CANADIAN INDUSTRIES LTD EDMONTON           FINAL EFFLUENT GRAB
NW S36 T52 R24 W4M
                        07105L      07205L      07562L      07021L      07906L      07905L      15421L      97160S
                       NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN   PHOSPHORUS  DISCHARGE
                       DISSOLVED   DISSOLVED   DISSOLVED    TOTAL    PARTICULATE PARTICULATE   TOTAL       INSTANT
                       NO3 & NO2   NITRITE     AMMONIA     KJELDAHL    TOTAL      (CALCD.)
                SUBM       N           N           N           N           N           N           P
                 ID      MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        M3/S
SAMPLES(FLAGS)          10(0)       10(8)        9(0)       10(0)        6(1)                    10(0)
           LOW            .03        L.02        .084          .4        L.01                     .010
          HIGH           15.5         .96       1.340       2.320         .23                      .12
       AVERAGE          2.068       .150*        .602        .874       .090*                     .041
      STD.DEV.          4.773       .287*        .429        .606       .079*                     .038
  PERCNT:10TH            .065      L.035                     .400                                 .011
          25TH            .15       L.05         .334        .425        .030                     .015
   MEDIAN 50TH           .450      L.050         .520        .773        .075                     .024
          75TH           .740      L.050          .80        .825         .12                     .076
          90TH          9.000       .565                    1.910                                 .100
SECONDARY CODE          10L         06L         61L         15L                               19L 06L
                        10474L      10407L      10511L      10453L      14101L      97160S      97163S
                       RESIDUE     RESIDUE     RESIDUE     RESIDUE      SILICA    DISCHARGE   DISCHARGE
                        TOTAL    NONFILTRABLE  VOLATILE   FILTRABLE    REACTIVE    INSTANT      DAILY
                                              NONFILTR.                                         MEAN
                SUBM                          (CALCD.)                   SIO2
                 ID      MG/L        MG/L        MG/L        MG/L        MG/L        M3/S        CFS
SAMPLES(FLAGS)          10(0)       10(0)        1(0)        8(0)       10(0)                   10(0)
           LOW           200.         1.6        20.0        200.         3.0                     .03
          HIGH          432.8        36.0        20.0       430.0         5.8                     .29
       AVERAGE          303.6        13.9                   308.8        4.47                    .1860
      STD.DEV.           78.9        13.3                    80.3         .86                    .0699
  PERCNT:10TH           211.0         2.2                                3.20                    .0950
          25TH          243.4         3.4                   245.0         3.8                     .16
   MEDIAN 50TH          297.0         8.5                   310.0        4.70                    .1785
          75TH           339.         29.                   365.0         5.0                     .236
          90TH          425.9        34.5                                5.47                    .2680
SECONDARY CODE          71L         01L                     51L         02L
                        00205L      02074L      06537L      06524L      02001L      16101L      10701L      06608L
                        TOTAL     TURBIDITY    PHENOLIC     OIL AND      ODOUR     SULPHIDE    SURFACT.     CYANIDE
                       DISSOLVED               MATERIAL     GREASE    THRESHOLD   DISSOLVED    N-ALKYL
                        SOLIDS                                          NUMBER                 SULPHNTS.
                SUBM                            PHENOL                                 S          LAS          CN
                 ID      MG/L        NTU         MG/L        MG/L        TON         MG/L        MG/L        MG/L
SAMPLES(FLAGS)           9(0)        9(1)       10(3)       10(0)        1(0)                    8(1)        1(1)
           LOW          146.2         L.1       L.002          .3          1.                     .03        L.002
          HIGH          321.3        10.0        .093         6.8          1.                     .97        L.002
       AVERAGE          220.4        2.2*       .012*       1.530                                .296*
      STD.DEV.           52.8        3.0*       .028*       2.155                                .347*
  PERCNT:10TH                                   L.002        .350
          25TH          186.0         1.0       L.002          .4                                .075*
   MEDIAN 50TH           221.         1.2        .003        .600                                .130
          75TH           241.         2.0        .005         1.0                                .480
          90TH                                   .051       5.400
SECONDARY CODE                                              21L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  11                     NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                      INDUSTRIAL MONITORING
STATION 20AL05EB0800    LAT. 53D 32M 28S  LONG. 113D 24M 37S   PR 3   UTM 12 340300E 5934950N  FOR MAR 12, 1981 TO JUL 25, 1984
CANADIAN INDUSTRIES LTD EDMONTON         FINAL EFFLUENT GRAB
NW S36 T52 R24 W4M

                          08304L       08202L       06107L       06154L       06001L       06051L       06006L       06905L
                          OXYGEN       OXYGEN       CARBON       CARBON       CARBON       CARBON       CARBON       CARBON
                           TOTAL      BIOCHEM.     DISSOLVED    DISSOLVED     TOTAL        TOTAL       TOTAL      PARTICULATE
                            COD      DEMAND-BOD     ORGANIC     INORGANIC     ORGANIC     INORGANIC                   TOTAL
                  SUBM      02            02          C            C            C            C            C            C
                   ID      MG/L        MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)            10(0)         1(1)        6(1)         6(0)         3(0)                                  6(0)
           LOW              8.5        L5.          L.4         14.90         4.0                                    .39
          HIGH             58.6        L5.         18.00        34.         138.0                                   8.50
       AVERAGE             19.4                     4.63*       27.40        48.67                                  2.35
      STD.DEV.             15.3                     6.65*        6.51        77.36                                  3.08
  PERCNT:10TH               9.3
          25TH             10.                      1.4         27.5                                                 .57
   MEDIAN 50TH             13.6                     2.00        29.00         4.0                                   1.24
          75TH             20.0                     4.          30.0                                                2.16
          90TH             44.8
SECONDARY CODE            01L                                             07L 05L

                          24101L       24009L       24302L       80015L       80011L       27009L       27302L       47304L
                         CHROMIUM     CHROMIUM     CHROMIUM     MERCURY      MERCURY      COBALT       COBALT       SILVER
                        HEXAVALENT     TOTAL       EXTRBLE.      TOTAL        TOTAL        TOTAL       EXTRBLE.     EXTRBLE.

                  SUBM      CR          CR           CR           HG           HG           CO           CO           AG
                   ID      MG/L        MG/L         MG/L         MG/L         UG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)             9(4)        9(0)         1(0)         9(6)         1(1)         9(6)         1(1)         2(2)
           LOW              .0          .004         .004       L.0001        L.02        L.001        L.001        L.02
          HIGH              .06         .560         .004        .0006        L.02        L.01         L.001        L.02
       AVERAGE              .013*       .097                     .0002*                    .004*
      STD.DEV.              .023*       .179                     .0002*                    .004*
  PERCNT:10TH
          25TH            L.001         .008                    L.0001                    L.001
   MEDIAN 50TH            L.001         .029                    L.0001                     .003                     L.020
          75TH              .006        .061                     .0001                     .004
          90TH
SECONDARY CODE

                          29009L       29305L       28009L       28302L       48009L       48302L       82009L       82302L
                          COPPER       COPPER       NICKEL       NICKEL       CADMIUM      CADMIUM      LEAD         LEAD
                           TOTAL      EXTRBLE.      TOTAL       EXTRBLE.      TOTAL       EXTRBLE.      TOTAL       EXTRBLE.

                  SUBM      CU          CU           NI           NI           CD           CD           PB           PB
                   ID      MG/L        MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)             9(1)        1(0)         9(2)         1(1)         9(9)         1(1)         5(4)         5(5)
           LOW              .004        .011         .004        L.001        L.001        L.001        L.003        L.002
          HIGH              .033        .011        L.02         L.001        L.01         L.001         .005        L.02
       AVERAGE              .015*                    .009*                                               .003*
      STD.DEV.              .010*                    .006*                                               .001*
  PERCNT:10TH
          25TH              .009                     .005                     L.001                     L.003        L.003
   MEDIAN 50TH              .010                     .007                     L.001                     L.003        L.003
          75TH              .023                     .009                     L.001                     L.003        L.02
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0010 -  0012 PAGE  12                       NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                      INDUSTRIAL MONITORING
STATION 20AL05EB0800    LAT. 53D 32M 28S  LONG. 113D 24M 37S   PR 3   UTM 12 340300E 5934950N  FOR MAR 12, 1981 TO JUL 25, 1984
CANADIAN INDUSTRIES LTD EDMONTON           FINAL EFFLUENT GRAB
NW S36 T52 R24 W4M

                       30009L      30305L      25003L      25304L      23009L      42304L      42009L      51003L
                        ZINC        ZINC      MANGANESE   MANGANESE   VANADIUM   MOLYBDENUM  MOLYBDENUM   ANTIMONY
                        TOTAL      EXTRBLE.     TOTAL      EXTRBLE.     TOTAL     EXTRBLE.     TOTAL       TOTAL

                 SUBM    ZN          ZN          MN          MN          V          MO          MO          SB
                  ID     MG/L        MG/L        MG/L        MG/L        MG/L       MG/L        MG/L        MG/L
SAMPLES(FLAGS)           9(0)        1(0)        9(1)        1(0)        9(6)                   7(5)        1(0)
           LOW           .008        .014        .006        .03         L.001                  L.001       .002
          HIGH           .063        .014        .073        .03         L.01                   .04         .002
       AVERAGE           .036                    .025*                   .005*                  .007*
      STD.DEV.           .020                    .021*                   .004*                  .015*
   PERCNT:10TH
          25TH           .03                     .009                    L.002                  L.001
   MEDIAN 50TH           .033                    .020                    .004                   L.001
          75TH           .055                    .028                    .007                   .004
          90TH
SECONDARY CODE                                                           02L

                       33005L      33104L      34005L      34102L      13111L      13306L      04102L      04304L
                       ARSENIC     ARSENIC    SELENIUM    SELENIUM    ALUMINUM    ALUMINUM   BERYLLIUM   BERYLLIUM
                        TOTAL     DISSOLVED    TOTAL      DISSOLVED   DISSOLVED   EXTRBLE.   DISSOLVED    EXTRBLE.

                 SUBM    AS          AS          SE          SE          AL          AL          BE          BE
                  ID     MG/L        MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           5(4)        1(0)        4(2)        1(1)        1(0)        7(0)        2(2)        7(7)
           LOW           L.0002      .0004       L.0002      L.0002      1600.       .185        L.005       L.001
          HIGH           L.001       .0004       L.001       L.0002      1600.       .536        L.005       L.001
       AVERAGE           .0004*                  .0005*                              .349
      STD.DEV.           .0003*                  .0003*                              .133
   PERCNT:10TH
          25TH           L.0002                  .0003*                              .21                     L.001
   MEDIAN 50TH           L.0002                  .0005                               .335        L.005       L.001
          75TH           .0004                   .0007*                              .502                    L.001
          90TH
SECONDARY CODE                                   07L                                 02L                     02L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  13                   NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB0801    LAT. 53D 32M 28S  LONG. 113D 24M 37S   PR 3   UTM 12 340300E 5934950N  FOR JUL 06, 1982 TO JUL 24, 1984
CANADIAN INDUSTRIES LTD EDMONTON          FINAL EFFLUENT COMP.
NW S36 T52 R24 W4M

                      02061F        10301L        10301F       10151L       10101L       02041L       97160S       97163S
                    TEMPERATURE       PH            PH        ALKALINITY   ALKALINITY   SPECIFIC    DISCHARGE    DISCHARGE
                    OF WATER                                    PHENOL        TOTAL     CONDUCT.     INSTANT       DAILY
                                                              PHTHALEIN                                             MEAN
               SUBM                                             CACO3        CACO3
                ID     DEG.C        PH UNITS      PH UNITS       MG/L         MG/L        US/CM        M3/S          CFS
SAMPLES(FLAGS)                        3(0)                       2(1)         3(0)        3(0)                      3(0)
           LOW                        7.09                         .0         62.6        328.                       .15
          HIGH                        8.30                        L.1         106.        373.                       .236
       AVERAGE                                                    .0*         81.5        348.                       .1910
      STD.DEV.                                                    .1*         22.2         23.                       .0431
   PERCNT:10TH
          25TH
   MEDIAN 50TH                        7.9                         .0*         76.0        344.                       .187
          75TH
          90TH
SECONDARY CODE

                      06201L        06202L        06301L       20103L       20105L       10602L       10604L       97160S
                    BICARBONT.    BICARBONT.    CARBONATE     CALCIUM      CALCIUM     HARDNESS     HARDNESS    DISCHARGE
                     (CALCD.)      (CALCD.)      (CALCD.)    DISSOLVED    DISSOLVED      TOTAL        TOTAL       INSTANT
                                                                          (CALCD.)     (CALCD.)
               SUBM   HCO3          HCO3          CO3           CA           CA         CACO3        CACO3
                ID   MG/L           MG/L          MG/L         MG/L         MG/L         MG/L         MG/L         M3/S
SAMPLES(FLAGS)        2(1)          2(0)          2(1)         3(0)         1(0)         3(0)         1(0)
           LOW        Q92.           76.            0.         28.0         27.8        123.4        123.0
          HIGH        129.           93.           Q0.          47.         27.8        154.4        123.0
       AVERAGE        111.*          85.            0.*        37.3                     140.5
      STD.DEV.         26.*          12.            0.*         9.5                      15.7
   PERCNT:10TH
          25TH
   MEDIAN 50TH        111.           85.            0.         36.9                     143.6
          75TH
          90TH
SECONDARY CODE                                            10L

                      11103L        12102L        19103L       09107L       17203L       16306L       26009L       26304L
                      SODIUM       MAGNESIUM     POTASSIUM     FLUORIDE     CHLORIDE     SULPHATE       IRON         IRON
                    DISSOLVED     DISSOLVED     DISSOLVED     DISSOLVED    DISSOLVED    DISSOLVED      TOTAL       EXTRBLE.

               SUBM    NA            MG             K             F            CL           S04          FE           FE
                ID    MG/L          MG/L          MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)        3(0)          3(0)          3(0)         3(0)         3(0)         3(0)                      2(0)
           LOW          8.            9.           .90          .89           5.          70.                       .090
          HIGH        13.0          13.0          1.31        1.220        10.00         84.0                       .14
       AVERAGE         9.9          11.5          1.17        1.007         7.57         75.8                       .115
      STD.DEV.         2.7           2.2           .23         .185         2.50          7.3                       .035
   PERCNT:10TH
          25TH
   MEDIAN 50TH         8.6          12.5          1.3           .91         7.70         73.5                       .115
          75TH
          90TH
SECONDARY CODE                                            05L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  14                      NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                    INDUSTRIAL MONITORING
STATION 20AL05EB0801    LAT. 53D 32M 28S  LONG. 113D 24M 37S   PR 3   UTM 12 340300E 5934950N  FOR JUL 06, 1982 TO JUL 24, 1984
CANADIAN INDUSTRIES LTD EDMONTON          FINAL EFFLUENT COMP.
NW S36 T52 R24 W4M

                         07105L        07205L        07562L        07021L        07906L        07905L        15421L        97160S
                        NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN     PHOSPHORUS    DISCHARGE
                        DISSOLVED     DISSOLVED     DISSOLVED      TOTAL      PARTICULATE   PARTICULATE     TOTAL         INSTANT
                        NO3 & NO2      NITRITE      AMMONIA       KJELDAHL      TOTAL        (CALCD.)
                 SUBM       N             N             N             N             N             N             P
                  ID       MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          M3/S
SAMPLES(FLAGS)             3(0)          3(2)          2(0)          3(0)          1(0)                        3(0)
           LOW             .100          L.05           .697          .800          .050                        .008
          HIGH             .620           .085         1.490         2.000          .050                        .063
       AVERAGE             .390           .062*        1.093         1.207                                      .035
      STD.DEV.             .265           .020*         .561          .687                                      .028
   PERCNT:10TH
          25TH
   MEDIAN 50TH             .45           L.050         1.093          .82                                       .035
          75TH
          90TH
SECONDARY CODE          10L           06L                         15L                                       06L

                         10474L        10407L        10511L        10453L        14101L        97160S        97163S
                         RESIDUE       RESIDUE       RESIDUE       RESIDUE       SILICA      DISCHARGE     DISCHARGE
                          TOTAL      NONFILTRABLE   VOLATILE      FILTRABLE     REACTIVE      INSTANT        DAILY
                                                    NONFILTR.                                                MEAN
                 SUBM                               (CALCD.)                      SIO2
                  ID       MG/L          MG/L         MG/L          MG/L          MG/L          M3/S          CFS
SAMPLES(FLAGS)             3(0)          3(1)                       3(0)          3(0)                        3(0)
           LOW            202.0          L2.0                       200.          3.20                        .15
          HIGH            287.           15.0                       300.0         5.40                        .236
       AVERAGE            236.3           8.0*                      260.0         4.43                        .1910
      STD.DEV.             44.8           6.6*                       52.9         1.12                        .0431
   PERCNT:10TH
          25TH
   MEDIAN 50TH            220.            7.                        280.          4.7                         .187
          75TH
          90TH
SECONDARY CODE          71L           01L                         51L           02L

                         00205L        02074L        06537L        06524L        02001L        16101L        10701L        06608L
                         TOTAL        TURBIDITY     PHENOLIC      OIL AND        ODOUR        SULPHIDE      SURFACT.       CYANIDE
                        DISSOLVED                   MATERIAL      GREASE       THRESHOLD     DISSOLVED      N-ALKYL
                         SOLIDS                                                  NUMBER                    SULPHNTS.
                 SUBM                               PHENOL                                       S            LAS           CN
                  ID       MG/L          NTU          MG/L          MG/L           TON          MG/L          MG/L          MG/L
SAMPLES(FLAGS)             2(0)          3(0)         2(1)          2(0)                                      2(0)
           LOW            186.8           1.0         L.002         1.100                                     .04
          HIGH            205.           15.0          .003         9.3                                       .37
       AVERAGE            195.9           6.2          .002*        5.200                                     .205
      STD.DEV.             12.9           7.7          .001*        5.798                                     .233
   PERCNT:10TH
          25TH
   MEDIAN 50TH            195.9           2.5          .002*        5.200                                     .205
          75TH
          90TH
SECONDARY CODE                                                    21L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  15                       NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                      INDUSTRIAL MONITORING
STATION 20AL05EB0801    LAT. 53D 32M 28S  LONG. 113D 24M 37S   PR 3   UTM 12 340300E 5934950N  FOR JUL 06, 1982 TO JUL 24, 1984
CANADIAN INDUSTRIES LTD EDMONTON            FINAL EFFLUENT COMP.
NW S36 T52 R24 W4M

                         08304L       08202L       06107L       06154L       06001L       06051L       06006L       06905L
                         OXYGEN       OXYGEN       CARBON       CARBON       CARBON       CARBON       CARBON       CARBON
                          TOTAL       BIOCHEM.     DISSOLVED    DISSOLVED     TOTAL        TOTAL       TOTAL        PARTICULATE
                          COD         DEMAND-BOD   ORGANIC      INORGANIC     ORGANIC      INORGANIC                  TOTAL
                 SUBM     02            02         C            C             C            C            C             C
                  ID     MG/L         MG/L         MG/L         MG/L          MG/L         MG/L         MG/L          MG/L
SAMPLES(FLAGS)            3(0)                      1(0)         1(0)          1(0)                                    1(0)
           LOW             8.0                      11.20        15.10          3.7                                     1.04
          HIGH            60.                       11.20        15.10          3.7                                     1.04
       AVERAGE            36.2
      STD.DEV.            26.3
   PERCNT:10TH
          25TH
   MEDIAN 50TH            40.5
          75TH
          90TH
SECONDARY CODE           01L                                                  05L

                         24101L       24009L       24302L       80015L       80011L       27009L       27302L       47304L
                         CHROMIUM     CHROMIUM     CHROMIUM     MERCURY      MERCURY      COBALT       COBALT       SILVER
                         HEXAVALENT   TOTAL         EXTRBLE.    TOTAL        TOTAL        TOTAL        EXTRBLE.     EXTRBLE.

                 SUBM     CR           CR           CR           HG           HG           CO           CO           AG
                  ID     MG/L         MG/L         MG/L         MG/L         UG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)            2(0)         1(0)         1(0)         1(1)         1(0)         1(0)         1(1)
           LOW            .012          .175         .02         L.0001        .000         .004        L.001
          HIGH            .020          .175         .02         L.0001        .000         .004        L.001
       AVERAGE            .016
      STD.DEV.            .006
   PERCNT:10TH
          25TH
   MEDIAN 50TH            .016
          75TH
          90TH
SECONDARY CODE

                         29009L       29305L       28009L       28302L       48009L       48302L       82009L       82302L
                         COPPER       COPPER       NICKEL       NICKEL       CADMIUM      CADMIUM      LEAD         LEAD
                          TOTAL       EXTRBLE.     TOTAL        EXTRBLE.     TOTAL        EXTRBLE.     TOTAL        EXTRBLE.

                 SUBM     CU           CU           NI           NI           CD           CD           PB           PB
                  ID     MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)            1(0)         1(0)         1(0)         1(0)         1(0)         1(1)                      2(1)
           LOW            .014          .046         .007         .002         .002        L.001                     L.002
          HIGH            .014          .046         .007         .002         .002        L.001                      .011
       AVERAGE                                                                                                        .006*
      STD.DEV.                                                                                                        .006*
   PERCNT:10TH
          25TH
   MEDIAN 50TH                                                                                                        .006*
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0010 -  0012 PAGE  16                     NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB0801    LAT. 53D 32M 28S  LONG. 113D 24M 37S   PR 3   UTM 12 340300E 5934950N  FOR JUL 06, 1983 TO JUL 24, 1984
CANADIAN INDUSTRIES LTD EDMONTON          FINAL EFFLUENT COMP.
NW S36 T52 R24 W4M
                      30009L        30305L        25003L        25304L        23009L        42304L        42009L        51003L
                       ZINC          ZINC         MANGANESE     MANGANESE     VANADIUM      MOLYBDENUM    MOLYBDENUM    ANTIMONY
                      TOTAL         EXTRBLE.      TOTAL         EXTRBLE.      TOTAL         EXTRBLE.      TOTAL         TOTAL
                 SUBM ZN            ZN            MN            MN            V             MO            MO            SB
                  ID  MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)         1(0)          1(0)          1(1)          1(0)          2(1)                        1(1)
                 LOW   .086          .500          L.008         .05           L.001                       L.001
                HIGH   .086          .500          L.008         .05           .007                        L.001
             AVERAGE                                                           .004*
            STD.DEV.                                                           .004*
         PERCNT:10TH
                25TH
         MEDIAN 50TH                                                           .004*
                75TH
                90TH
      SECONDARY CODE                                                        02L
                      33005L        33104L        34005L        34102L        13111L        13306L        04102L        04304L
                      ARSENIC       ARSENIC       SELENIUM      SELENIUM      ALUMINUM      ALUMINUM      BERYLLIUM     BERYLLIUM
                      TOTAL         DISSOLVED     TOTAL         DISSOLVED     DISSOLVED     EXTRBLE.      DISSOLVED     EXTRBLE.
                 SUBM AS            AS            SE            SE            AL            AL            BE            BE
                  ID  MG/L          MG/L          MG/L          MG/L          UG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)         1(1)          1(0)                        1(1)                        2(0)                        2(2)
                 LOW  L.0002         .0004                      L.0002                        .34                        L.001
                HIGH  L.0002         .0004                      L.0002                        .477                       L.001
             AVERAGE                                                                          .409
            STD.DEV.                                                                          .097
         PERCNT:10TH
                25TH
         MEDIAN 50TH                                                                          .409                       L.001
                75TH
                90TH
      SECONDARY CODE                                                                    02L                         02L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  17                     NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB1400    LAT. 53D 33M  6S  LONG. 113D 23M 38S   PR 3   UTM 12 341400E 5936100N  FOR APR 29, 1980 TO AUG 16, 1984
IMPERIAL OIL LTD STRATHCONA               FINAL EFFLUENT GRAB
S36 T52 R24 W4M
                       02061F        10301L        10301F        10151L        10101L        02041L        97160S        97163S
                    TEMPERATURE        PH            PH        ALKALINITY    ALKALINITY     SPECIFIC     DISCHARGE      DISCHARGE
                    OF WATER                                      PHENOL        TOTAL       CONDUCT.       INSTANT        DAILY
                                                                PHTHALEIN                                                 MEAN
               SUBM                                              CACO3          CACO3
                ID     DEG.C       PH UNITS      PH UNITS        MG/L          MG/L          US/CM         M3/S           CFS
SAMPLES(FLAGS)           15(0)        17(0)           4(0)         16(1)         17(0)         17(0)                       17(0)
           LOW            13.5          6.5            7.0            .0           55.         1160.                         .46
          HIGH            32.0          8.4            8.6           4.2          140.         3210.                        3.44
       AVERAGE            22.0                                       .3*         109.0         1822.                      2.0059
      STD.DEV.             5.3                                      1.0*          24.0          618.                       .8253
   PERCNT:10TH            16.0          6.7                           .0           74.         1233.                         .49
          25TH             19.          7.0           7.25            .0          101.         1350.                        1.56
   MEDIAN 50TH            21.0          7.2           7.55            .0          113.         1702.                        2.18
          75TH            26.0          7.4           8.10            .0          128.         2120.                        2.44
          90TH            29.0          7.7                          L.5         134.0         2920.                        2.96
SECONDARY CODE

                       06201L        06202L        06301L        20103L        20105L        10602L        10604L        97160S
                     BICARBONT.    BICARBONT.     CARBONATE      CALCIUM       CALCIUM     HARDNESS      HARDNESS     DISCHARGE
                       (CALCD.)     (CALCD.)      (CALCD.)      DISSOLVED     DISSOLVED      TOTAL           TOTAL      INSTANT
                                                                              (CALCD.)      (CALCD.)
               SUBM   HCO3            HCO3           CO3            CA           CA          CACO3         CACO3
                ID   MG/L             MG/L          MG/L          MG/L          MG/L          MG/L          MG/L            M3/S
SAMPLES(FLAGS)           16(1)         5(0)          16(1)         16(0)          5(0)         12(0)          6(0)
           LOW             67.         127.             0.           77.          50.8         269.7          263.
          HIGH            171.         450.             5.          246.         151.7         565.0          754.
       AVERAGE            131.*        204.             0.*        127.4         118.6         371.3         496.7
      STD.DEV.             30.*        138.             1.*         48.5          40.5          91.2         177.3
   PERCNT:10TH             84.                          0.           80.                       270.5
          25TH            115.         130.             0.          92.5         118.6         300.0          383.
   MEDIAN 50TH            134.         150.             0.         117.0         124.4         349.9         470.0
          75TH            154.         163.             0.         138.0         147.7         421.2         640.0
          90TH            163.                         Q1.         208.0                       497.2
SECONDARY CODE                                               11L 10L

                       11103L        12102L        19103L        09107L        17203L        16306L        26009L        26304L
                       SODIUM      MAGNESIUM      POTASSIUM      FLUORIDE      CHLORIDE       SULPHATE       IRON          IRON
                      DISSOLVED    DISSOLVED      DISSOLVED      DISSOLVED     DISSOLVED     DISSOLVED      TOTAL        EXTRBLE.

               SUBM      NA            MG             K            F             CL           SO4           FE             FE
                ID      MG/L         MG/L           MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)           17(0)        17(0)          17(0)         17(0)         17(0)         17(0)          2(0)         15(0)
           LOW             96.          17.            2.2           .18         103.0          190.            .3           .09
          HIGH            407.          35.           13.0         33.26          781.         359.0           .67          3.97
       AVERAGE           196.3         24.8           7.36         5.061        343.94         258.8          .485          .703
      STD.DEV.           100.0          5.6           3.28         9.619        198.34          50.6          .262         1.016
   PERCNT:10TH            104.          19.            2.8           .20          135.          190.                        .23
          25TH            118.          21.            4.7          .680          185.          220.                        .30
   MEDIAN 50TH            164.          23.            7.1           .95          300.         241.0          .485           .32
          75TH            239.          30.            9.0          3.35          450.         295.0                        .56
          90TH            375.          33.            13.         26.75          710.          333.                       2.07
SECONDARY CODE         11L           11L           11L           06L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  18                        NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                        INDUSTRIAL MONITORING
STATION 20AL05EB1400    LAT. 53D 33M  6S  LONG. 113D 23M 38S   PR 3   UTM 12 341400E 5936100N  FOR APR 29, 1980 TO AUG 16, 1984
IMPERIAL OIL LTD STRATHCONA                FINAL EFFLUENT GRAB
S36 T52 R24 W4M

                         07105L       07205L       07562L       07021L       07906L       07905L       15421L       97160S
                        NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN    PHOSPHORUS    DISCHARGE
                        DISSOLVED    DISSOLVED    DISSOLVED     TOTAL      PARTICULATE  PARTICULATE    TOTAL        INSTANT
                        NO3 & NO2    NITRITE      AMMONIA      KJELDAHL      TOTAL       (CALCD.)
                SUBM       N            N            N            N            N            N            P
                 ID       MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)           17(11)       17(12)       17(0)        16(0)        12(0)                     16(0)        M3/S
           LOW            L.02         L.02          .096        2.0           .23                       .24
          HIGH             .27          .15         5.300       13.200        1.6                       1.700
       AVERAGE             .083*        .061*       1.642        4.705         .889                      .764
      STD.DEV.             .069*        .033*       1.350        2.613         .417                      .448
  PERCNT:10TH             L.02         L.02          .350        2.5           .36                       .330
          25TH            L.05         L.05          .750        3.119         .585                      .455
   MEDIAN 50TH            L.05         L.05         1.440        4.[illegible]50         .895                      .640
          75TH             .10          .053        2.020        5.145        1.205                      .895
          90TH             .21          .10         3.650        7.000        1.30                      1.6
SECONDARY CODE                                    61L          15L                                   19L 06L

                         10474L       10407L       10511L       10453L       14101L       97160S       97163S
                        RESIDUE      RESIDUE      RESIDUE      RESIDUE      SILICA      DISCHARGE    DISCHARGE
                         TOTAL     NONFILTRABLE   VOLATILE    FILTRABLE    REACTIVE      INSTANT       DAILY
                                                 NONFILTR.                                              MEAN
                SUBM                             (CALCD.)                   SIO2
                 ID      MG/L         MG/L         MG/L         MG/L         MG/L         M3/S         CFS
SAMPLES(FLAGS)          15(0)        17(0)         1(0)        13(0)        17(0)                     17(0)
           LOW          771.          10.0         34.0         540.          5.0                       .46
          HIGH          2178.0       231.          34.0        1680.         19.4                      3.44
       AVERAGE          1226.8        39.8                     1038.2         8.94                     2.0059
      STD.DEV.           367.7        54.3                      280.9         3.54                      .8253
  PERCNT:10TH            868.         10.                       726.          6.20                      .49
          25TH           970.         18.                       860.          6.8                      1.56
   MEDIAN 50TH          1114.         24.                      1060.          8.0                      2.18
          75TH          1308.         27.                      1180.          8.5                      2.44
          90TH          1699.        109.                      1290.         15.6                      2.96
SECONDARY CODE          71L          01L                       51L          02L

                         00205L       02074L      06537L       06524L       02001L       16101L       10701L       06608L
                         TOTAL      TURBIDITY    PHENOLIC     OIL AND       ODOUR      SULPHIDE     SURFACT.      CYANIDE
                       DISSOLVED                 MATERIAL     GREASE      THRESHOLD    DISSOLVED     N-ALKYL
                        SOLIDS                                              NUMBER                  SULPHNTS.
                SUBM                             PHENOL                                    S           LAS          CN
                 ID      MG/L        NTU          MG/L         MG/L          TON         MG/L         MG/L         MG/L
SAMPLES(FLAGS)          16(0)        14(0)        17(0)        16(0)        14(0)        13(3)        13(0)         7(2)
           LOW          664.          3.0          .020        1.              1.        L.02          .15        L.002
          HIGH          2035.        78.0          .780       25.6           100.         .50         5.40          .160
       AVERAGE          1053.5       23.6          .133        6.969          19.         .155*       1.816         .0376*
      STD.DEV.           397.2       23.9          .211        6.997          35.         .135*       1.720         .0550*
  PERCNT:10TH            700.         4.5          .022        1.0             1.        L.02          .28
          25TH           804.0        5.5          .027        2.150           1.         .060          .45          .008
   MEDIAN 50TH           868.5       13.3          .044        5.000           7.         .13         1.46         L.02
          75TH          1261.2       45.0          .121        7.700          10.         .20         2.60          .035
          90TH          1632.0       61.           .530       20.5           100.         .32         4.25
SECONDARY CODE                       73L                      21L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  19                         NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                       INDUSTRIAL MONITORING
STATION 20AL05EB1400    LAT. 53D 33M  6S  LONG. 113D 23M 38S   PR 3   UTM 12 341400E 5936100N  FOR APR 29, 1980 TO AUG 16, 1984
IMPERIAL OIL LTD STRATHCONA                 FINAL EFFLUENT GRAB
S36 T52 R24 W4M

                         08304L      08202L       06107L      06154L      06001L      06051L      06006L      06905L
                         OXYGEN      OXYGEN       CARBON      CARBON      CARBON      CARBON      CARBON      CARBON
                          TOTAL      BIOCHEM.    DISSOLVED   DISSOLVED    TOTAL       TOTAL      TOTAL       PARTICULATE
                           COD      DEMAND-BOD    ORGANIC    INORGANIC   ORGANIC    INORGANIC                 TOTAL
                  SUBM     02          02          C           C           C           C           C           C
                   ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           17(0)        3(0)       13(0)       12(0)        4(0)        2(0)        1(0)       12(0)
           LOW            58.5         5.3         7.7        11.         13.5        12.         31.          2.36
          HIGH           235.0        44.7        95.         35.8        30.3        25.0        31.         34.85
       AVERAGE           115.2        19.93       19.24       27.04       21.45       18.50                   10.73
      STD.DEV.            55.0        21.57       23.13        6.57        7.07        9.19                   10.40
   PERCNT:10TH            64.0                     8.         20.                                              4.29
          25TH            69.9                     9.         24.50       16.25                                5.03
   MEDIAN 50TH            86.5         9.8        13.0        28.50       21.00       18.50                    6.15
          75TH           153.0                    16.         31.00       26.65                               11.15
          90TH           198.                     21.0        32.                                             29.31
SECONDARY CODE           01L                     01L                     05L 07L     52L

                         24101L      24009L       24302L      80015L      80011L      27009L      27302L      47304L
                        CHROMIUM    CHROMIUM     CHROMIUM    MERCURY     MERCURY     COBALT      COBALT      SILVER
                       HEXAVALENT    TOTAL        EXTRBLE.    TOTAL       TOTAL       TOTAL      EXTRBLE.    EXTRBLE.

                  SUBM     CR          CR          CR          HG          HG          CO          CO          AG
                   ID     MG/L        MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           15(11)      16(0)                   15(13)       2(2)       16(7)        1(0)        2(2)
           LOW            L.001        .120                  L.0001       L.02        L.001        .003       L.02
          HIGH             .087        .963                   .0062       L.02        1.79         .003       L.02
       AVERAGE             .010*       .304                   .0005*                   .115*
      STD.DEV.             .022*       .224                   .0016*                   .447*
   PERCNT:10TH            L.001        .133                  L.0001                   L.001
          25TH            L.001        .191                  L.0001                   L.001
   MEDIAN 50TH            L.001        .249                  L.0001       L.020        .003                   L.020
          75TH            L.01         .291                  L.0001                    .006
          90TH             .023        .735                   .0002                   L.01
SECONDARY CODE

                         29009L      29305L       28009L      28302L      48009L      48302L      82009L      82302L
                         COPPER      COPPER       NICKEL      NICKEL      CADMIUM     CADMIUM     LEAD        LEAD
                          TOTAL      EXTRBLE.     TOTAL       EXTRBLE.    TOTAL       EXTRBLE.    TOTAL       EXTRBLE.

                  SUBM     CU          CU          NI          NI          CD          CD          PB          PB
                   ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           16(1)        1(0)       16(2)        1(0)       15(10)       1(1)        7(1)       10(7)
           LOW             .003        .011        .008        .002       L.001       L.001       L.003       L.002
          HIGH             .080        .011        .052        .002       L.01        L.001        .014       L.02
       AVERAGE             .018*                   .020*                   .003*                   .007*       .007*
      STD.DEV.             .019*                   .013*                   .003*                   .004*       .007*
   PERCNT:10TH            L.005                    .009                   L.001                               L.002
          25TH             .006                    .011                   L.001                    .005       L.003
   MEDIAN 50TH             .011                    .017                   L.001                    .005        .004*
          75TH             .027                   L.020                    .003                    .010        .008
          90TH             .032                    .044                   L.01                                L.020
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0010 -  0012 PAGE  20                         NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                        INDUSTRIAL MONITORING
STATION 20AL05EB1400    LAT. 53D 33M  6S  LONG. 113D 23M 38S   PR 3   UTM 12 341400E 5936100N  FOR APR 29, 1980 TO AUG 16, 1984
IMPERIAL OIL LTD STRATHCONA                 FINAL EFFLUENT GRAB
S36 T52 R24 W4M

                         30009L      30305L      25003L      25304L      23009L      42304L      42009L      51003L
                          ZINC        ZINC      MANGANESE   MANGANESE   VANADIUM   MOLYBDENUM  MOLYBDENUM   ANTIMONY
                         TOTAL     EXTRBLE.      TOTAL     EXTRBLE.      TOTAL     EXTRBLE.      TOTAL       TOTAL

                 SUBM      ZN          ZN          MN          MN          V           MO          MO          SB
                  ID      MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           16(0)        1(0)       16(0)        1(0)       13(2)                   12(4)        2(2)
           LOW            .070         .250        .025        .026        .001                  L.001       L.001
          HIGH           1.470         .250        .234        .026        .08                    1.21       L.001
       AVERAGE            .255                     .095                    .013*                   .106*
      STD.DEV.            .379                     .062                    .021*                   .348*
   PERCNT:10TH            .073                     .041                  L.002                   L.001
          25TH            .104                     .063                    .005                    .002*
    MEDIAN 50TH           .121                     .073                    .008                    .006       L.0010
          75TH            .165                     .102                    .010                    .009
          90TH            .901                     .215                    .015                  L.02
SECONDARY CODE                                                           02L

                         33005L      33104L      34005L      34102L      13111L      13306L      04102L      04304L
                         ARSENIC     ARSENIC    SELENIUM    SELENIUM    ALUMINUM    ALUMINUM   BERYLLIUM   BERYLLIUM
                         TOTAL     DISSOLVED    TOTAL      DISSOLVED   DISSOLVED   EXTRBLE.   DISSOLVED    EXTRBLE.

                 SUBM      AS          AS          SE          SE          AL          AL          BE          BE
                  ID      MG/L        MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            8(0)        1(0)        8(5)        1(1)        2(0)       11(0)        2(2)       11(10)
           LOW           .0058       .0058      L.0002      L.0002      170.          .039      L.005       L.001
          HIGH           .0130       .0058        .001      L.0002      230.         5.040      L.005        .003
       AVERAGE           .0091                   .0005*                 200.00        .922                   .001*
      STD.DEV.           .0021                   .0004*                  42.43       1.674                   .001*
   PERCNT:10TH                                                                        .060                 L.001
          25TH           .0081                  L.0002                                .076                 L.001
    MEDIAN 50TH          .0090                   .0002*                 200.00        .190      L.005      L.001
          75TH           .0099                   .0009*                                .44                 L.001
          90TH                                                                       3.390                 L.001
SECONDARY CODE                                 07L                                 02L                    02L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  21                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB1401    LAT. 53D 33M  6S  LONG. 113D 23M 38S   PR 3   UTM 12 341400E 5936100N  FOR MAY 05, 1981 TO AUG 16, 1984
IMPERIAL OIL LTD STRATHCONA                   FINAL EFFLUENT COMP.
S36 T52 R24 W4M
                       02061F        10301L        10301F        10151L        10101L        02041L        97160S        97163S
                    TEMPERATURE        PH            PH        ALKALINITY    ALKALINITY    SPECIFIC     DISCHARGE      DISCHARGE
                    OF WATER                                      PHENOL        TOTAL      CONDUCT.       INSTANT         DAILY
                                                                PHTHALEIN                                                 MEAN
               SUBM                                               CACO3         CACO3
                ID     DEG.C        PH UNITS      PH UNITS        MG/L          MG/L          US/CM         M3/S           CFS
SAMPLES(FLAGS)                          5(0)          1(0)          4(0)          5(0)          5(0)                        5(0)
           LOW                           6.7           8.4            .0           68.         1526.                        1.33
          HIGH                           7.4           8.4            .0          144.         2760.                        2.39
       AVERAGE                                                        .0         111.9         2147.                      1.9900
      STD.DEV.                                                        .0          29.1          511.                       .5134
   PERCNT:10TH
          25TH                           7.1                          .0          103.         1848.                        1.54
   MEDIAN 50TH                           7.2                          .0          114.         2030.                         2.3
          75TH                          7.30                          .0         130.5         2570.                        2.39
          90TH
SECONDARY CODE

                       06201L        06202L        06301L        20103L        20105L        10602L        10604L        97160S
                     BICARBONT.    BICARBONT.     CARBONATE     CALCIUM       CALCIUM       HARDNESS      HARDNESS     DISCHARGE
                      (CALCD.)     (CALCD.)       (CALCD.)     DISSOLVED     DISSOLVED      TOTAL         TOTAL          INSTANT
                                                                            (CALCD.)      (CALCD.)
               SUBM    HCO3           HCO3          CO3            CA            CA          CACO3         CACO3
                ID   MG/L             MG/L          MG/L          MG/L          MG/L          MG/L          MG/L           M3/S
SAMPLES(FLAGS)            4(0)          2(0)          4(0)          5(0)          2(0)          3(0)          3(0)
           LOW             83.          138.            0.          102.         119.3         328.8          422.
          HIGH            176.          159.            0.          232.         141.7         478.1          755.
       AVERAGE            131.          149.            0.         140.0         130.5         390.7         551.7
      STD.DEV.             38.           15.            0.          53.8          15.8          77.9         178.3
   PERCNT:10TH
          25TH            104.                          0.          105.
   MEDIAN 50TH            132.          149.            0.          119.         130.5         365.1         478.0
          75TH            157.                          0.         142.0
          90TH
SECONDARY CODE                                               11L 10L

                       11103L        12102L        19103L        09107L        17203L        16306L        26009L        26304L
                      SODIUM       MAGNESIUM     POTASSIUM      FLUORIDE      CHLORIDE      SULPHATE       IRON           IRON
                      DISSOLVED    DISSOLVED     DISSOLVED      DISSOLVED     DISSOLVED     DISSOLVED      TOTAL         EXTRBLE.
               SUBM     NA            MG            K             F             CL            SO4           FE            FE
                ID      MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)            5(0)          5(0)          5(0)          5(0)          5(0)          5(0)          1(0)          4(0)
           LOW            148.           18.           4.5           .20          260.          255.           .21           .13
          HIGH            374.           43.           13.         47.50          724.          349.           .21          3.60
       AVERAGE           260.2          29.2          8.20        11.938        431.60         293.2                       1.138
      STD.DEV.           105.8           9.1          3.23        20.072        183.18          37.4                       1.662
   PERCNT:10TH
          25TH            182.           25.           6.1          1.37          294.         267.0                        .135
   MEDIAN 50TH           227.0           30.          8.40          3.12        430.00          285.                        .410
          75TH            370.          30.0           9.0         7.500          450.          310.                       2.140
          90TH
SECONDARY CODE         11L           11L           11L           06L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  22                   NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                 INDUSTRIAL MONITORING
STATION 20AL05EB1401     LAT. 53D 33M  6S  LONG. 113D 23M 38S   PR 3   UTM 12 341400E 5936100N  FOR MAY 05, 1981 TO AUG 16, 1984
IMPERIAL OIL LTD STRATHCONA               FINAL EFFLUENT COMP.
S36 T52 R24 W4M

                         07105L       07205L       07562L       07021L       07906L       07905L       15421L       97160S
                        NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN    PHOSPHORUS   DISCHARGE
                        DISSOLVED    DISSOLVED    DISSOLVED     TOTAL      PARTICULATE  PARTICULATE    TOTAL       INSTANT
                        NO3 & NO2    NITRITE      AMMONIA      KJELDAHL      TOTAL       (CALCD.)
                 SUBM      N            N            N            N            N            N            P
                  ID      MG/L        MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         M3/S
SAMPLES(FLAGS)            5(3)         5(5)         5(0)         5(0)         4(0)                      5(0)
           LOW            L.02         L.02          .25          2.4          .56                       .480
          HIGH             .10         L.050        2.900       13.350         2.08                       2.0
       AVERAGE             .056*                    1.309        8.090        1.133                      1.034
      STD.DEV.             .029*                     .977        4.864         .718                       .663
   PERCNT:10TH
          25TH            L.05         L.05          .953        4.200         .575                       .600
    MEDIAN 50TH           L.050        L.05         1.120        8.000         .945                       .640
          75TH             .06         L.05         1.320       12.500        1.690                      1.450
          90TH
SECONDARY CODE                                     61L          15L                                     19L

                         10474L       10407L       10511L       10453L       14101L       97160S       97163S
                         RESIDUE      RESIDUE      RESIDUE      RESIDUE      SILICA      DISCHARGE    DISCHARGE
                          TOTAL    NONFILTRABLE   VOLATILE    FILTRABLE    REACTIVE      INSTANT       DAILY
                                                 NONFILTR.                                               MEAN
                 SUBM                            (CALCD.)                    SIO2
                  ID     MG/L         MG/L         MG/L         MG/L         MG/L         M3/S          CFS
SAMPLES(FLAGS)            5(0)         5(0)                      4(0)         5(0)                      5(0)
           LOW           1187.         19.4                     1150.         6.90                      1.33
          HIGH           2310.0        68.                      1670.        22.8                       2.39
       AVERAGE           1597.9        33.9                     1382.5       11.28                      1.9900
      STD.DEV.            461.6        20.3                      257.9        6.56                       .5134
   PERCNT:10TH
          25TH           1205.         20.0                     1165.0        8.0                       1.54
    MEDIAN 50TH          1549.3        25.                      1355.0        8.4                       2.3
          75TH           1738.         37.                      1600.0       10.3                       2.39
          90TH
SECONDARY CODE           71L          01L                                    02L

                         00205L       02074L       06537L       06524L       02001L       16101L       10701L       06608L
                          TOTAL      TURBIDITY    PHENOLIC     OIL AND       ODOUR       SULPHIDE     SURFACT.      CYANIDE
                        DISSOLVED                 MATERIAL     GREASE      THRESHOLD    DISSOLVED     N-ALKYL
                         SOLIDS                                              NUMBER                   SULPHNTS.
                 SUBM                              PHENOL                                    S           LAS           CN
                  ID     MG/L         NTU          MG/L         MG/L          TON          MG/L         MG/L         MG/L
SAMPLES(FLAGS)            5(0)         5(0)         5(0)         5(0)         4(0)                      4(0)         1(0)
           LOW            866.          5.0          .013          1.1          1.                        .11          .022
          HIGH           2225.         69.0          .110         53.8         100.                       3.75         .022
       AVERAGE           1310.6        29.6          .047         14.340        51.                       1.610
      STD.DEV.            535.1        29.8          .038         22.412        57.                       1.649
   PERCNT:10TH
          25TH           1004.          6.0          .019          1.5          2.                        .325
    MEDIAN 50TH          1182.8        14.0          .045          4.300        51.                       1.290
          75TH           1275.         54.0          .049         11.0         100.                       2.895
          90TH
SECONDARY CODE                                                   21L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  23                     NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                    INDUSTRIAL MONITORING
STATION 20AL05EB1401    LAT. 53D 33M  6S  LONG. 113D 23M 38S   PR 3   UTM 12 341400E 5936100N  FOR MAY 05, 1981 TO AUG 16, 1984
IMPERIAL OIL LTD STRATHCONA                  FINAL EFFLUENT COMP.
S36 T52 R24 W4M
                              08304L        08202L        06107L        06154L        06001L        06051L        06006L        06905L
                              OXYGEN        OXYGEN        CARBON        CARBON        CARBON        CARBON        CARBON        CARBON
                               TOTAL      BIOCHEM.     DISSOLVED     DISSOLVED         TOTAL         TOTAL         TOTAL   PARTICULATE
                                 COD    DEMAND-BOD       ORGANIC     INORGANIC       ORGANIC     INORGANIC                       TOTAL
                SUBM              02            02             C             C             C             C             C             C
                 ID             MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
  SAMPLES(FLAGS)                5(0)          1(0)          4(0)          4(0)          1(0)                                    4(0)
             LOW                72.6           9.0          9.50           16.          26.7                                    5.39
            HIGH               295.0           9.0           71.         31.10          26.7                                   53.15
         AVERAGE               165.3                       28.13         23.77                                                 19.92
        STD.DEV.                99.1                       28.93          7.88                                                 22.39
     PERCNT:10TH
            25TH                81.0                       10.75         17.00                                                  6.70
     MEDIAN 50TH               136.0                       16.00         24.00                                                 10.56
            75TH               242.0                       45.50         30.55                                                 33.14
            90TH
  SECONDARY CODE                 01L                                                   07L
                              24101L        24009L        24302L        80015L        80011L        27009L        27302L        47304L
                            CHROMIUM      CHROMIUM      CHROMIUM       MERCURY       MERCURY        COBALT        COBALT        SILVER
                          HEXAVALENT         TOTAL      EXTRBLE.         TOTAL         TOTAL         TOTAL      EXTRBLE.      EXTRBLE.

                SUBM              CR            CR            CR            HG            HG            CO            CO            AG
                 ID             MG/L          MG/L          MG/L          MG/L          UG/L          MG/L          MG/L          MG/L
  SAMPLES(FLAGS)                5(3)          4(0)                        5(4)                        4(0)
             LOW               L.001          .186                      L.0001                        .003
            HIGH                .010          .886                       .0042                        .007
         AVERAGE               .005*          .386                      .0009*                        .005
        STD.DEV.               .005*          .334                      .0018*                        .002
     PERCNT:10TH
            25TH               L.001          .204                      L.0001                        .004
     MEDIAN 50TH                .003          .236                      L.0001                        .005
            75TH                L.01          .569                      L.0001                        .007
            90TH
  SECONDARY CODE
                              29009L        29305L        28009L        28302L        48009L        48302L        82009L        82302L
                              COPPER        COPPER        NICKEL        NICKEL       CADMIUM       CADMIUM          LEAD          LEAD
                               TOTAL      EXTRBLE.         TOTAL      EXTRBLE.         TOTAL      EXTRBLE.         TOTAL      EXTRBLE.

                SUBM              CU            CU            NI            NI            CD            CD            PB            PB
                 ID             MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
  SAMPLES(FLAGS)                4(0)                        4(0)                        4(1)                        2(0)          2(1)
             LOW                .020                        .016                       L.001                        .005         L.003
            HIGH                .088                        .040                        .003                        .014          .014
         AVERAGE                .049                        .028                       .002*                        .010         .008*
        STD.DEV.                .029                        .012                       .001*                        .006         .008*
     PERCNT:10TH
            25TH                .029                        .018                       .001*
     MEDIAN 50TH                .044                        .028                        .003                        .010         .008*
            75TH                .069                        .038                        .003
            90TH
  SECONDARY CODE
```

```
REQUEST 0010 -  0012 PAGE  24                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB1401    LAT. 53D 33M  6S  LONG. 113D 23M 38S   PR 3   UTM 12 341400E 5936100N  FOR NOV 03, 1981 TO AUG 16, 1984
IMPERIAL OIL LTD STRATHCONA                FINAL EFFLUENT COMP.
S36 T52 R24 W4M

                             30009L      30305L      25003L      25304L      23009L      42304L      42009L      51003L
                              ZINC        ZINC      MANGANESE   MANGANESE   VANADIUM   MOLYBDENUM  MOLYBDENUM   ANTIMONY
                              TOTAL     EXTRBLE.      TOTAL     EXTRBLE.     TOTAL      EXTRBLE.     TOTAL       TOTAL

                    SUBM       ZN          ZN          MN          MN          V           MO          MO          SB
                     ID       MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)                4(0)                    4(0)                    3(0)                    3(0)
           LOW                .209                    .062                    .009                    .008
          HIGH               1.280                    .229                    .020                    .012
       AVERAGE                .510                    .129                    .013                    .009
      STD.DEV.                .514                    .080                    .006                    .002
   PERCNT:10TH
          25TH                .234                    .065
   MEDIAN 50TH                .276                    .112                    .009                    .008
          75TH                .786                    .193
          90TH
SECONDARY CODE

                             33005L      33104L      34005L      34102L      13111L      13306L      04102L      04304L
                             ARSENIC     ARSENIC    SELENIUM    SELENIUM    ALUMINUM    ALUMINUM   BERYLLIUM   BERYLLIUM
                             TOTAL      DISSOLVED   TOTAL       DISSOLVED   DISSOLVED   EXTRBLE.   DISSOLVED    EXTRBLE.

                    SUBM       AS          AS          SE          SE          AL          AL          BE          BE
                     ID       MG/L        MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)                2(0)                    2(2)                                3(0)                    3(3)
           LOW               .0056                   L.0002                               .054                   L.001
          HIGH               .0089                   L.0002                              6.600                   L.001
       AVERAGE               .0073                                                       2.295
      STD.DEV.               .0023                                                       3.730
   PERCNT:10TH
          25TH
   MEDIAN 50TH               .0073                   L.0002                               .230                   L.001
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  25                     NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                    INDUSTRIAL MONITORING
STATION 20AL05EB1409    LAT. 53D 33M  6S  LONG. 113D 23M 38S   PR 3   UTM 12 341400E 5936100N  FOR JUN 20, 1983 TO JUN 20, 1983
IMPERIAL OIL LTD STRATHCONA              STORM WATER POND - EFFLUENT GRAB

                        02061F        10301L        10301F        10151L        10101L        02041L        97160S        97163S
                      TEMPERATURE       PH            PH        ALKALINITY    ALKALINITY     SPECIFIC     DISCHARGE     DISCHARGE
                      OF WATER                                    PHENOL        TOTAL        CONDUCT.      INSTANT        DAILY
                                                                PHTHALEIN                                                  MEAN
                SUBM                                              CACO3         CACO3
                 ID     DEG.C         PH UNITS      PH UNITS      MG/L          MG/L          US/CM         M3/S          CFS
SAMPLES(FLAGS)           1(0)          1(0)                        1(0)          1(0)         1(0)
           LOW           17.           7.0                          .0           58.          511.
          HIGH           17.           7.0                          .0           58.          511.
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE

                        06201L        06202L        06301L        20103L        20105L        10602L        10604L        97160S
                      BICARBONT.    BICARBONT.    CARBONATE     CALCIUM       CALCIUM      HARDNESS      HARDNESS      DISCHARGE
                       (CALCD.)      (CALCD.)      (CALCD.)     DISSOLVED     DISSOLVED      TOTAL         TOTAL         INSTANT
                                                                              (CALCD.)      (CALCD.)
                SUBM    HCO3          HCO3          CO3           CA            CA           CACO3         CACO3
                 ID    MG/L           MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          M3/S
SAMPLES(FLAGS)           1(0)                        1(0)          1(0)                        1(0)
           LOW            71.                          0.           43.                         140.3
          HIGH            71.                          0.           43.                         140.3
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE                                                  10L

                        11103L        12102L        19103L        09107L        17203L        16306L        26009L        26304L
                        SODIUM       MAGNESIUM     POTASSIUM     FLUORIDE      CHLORIDE      SULPHATE       IRON          IRON
                       DISSOLVED     DISSOLVED     DISSOLVED     DISSOLVED     DISSOLVED     DISSOLVED      TOTAL         EXTRBLE.

                SUBM     NA            MG            K             F             CL           SO4           FE            FE
                 ID     MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)           1(0)          1(0)          1(0)          1(0)          1(0)          1(0)                        1(0)
           LOW           31.            8.           3.0           .94           52.           85.                         3.49
          HIGH           31.            8.           3.0           .94           52.           85.                         3.49
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  26                          NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                          INDUSTRIAL MONITORING
STATION 20AL05EB1409     LAT. 53D 33M  6S  LONG. 113D 23M 38S   FR 3   UTM 12 341400E 5936100N  FOR JUN 20, 1983 TO JUN 20, 1983
IMPERIAL OIL LTD STRATHCONA                    STORM WATER POND - EFFLUENT GRAB

                             07105L         07205L         07562L         07021L         07906L         07905L         15421L         97160S
                            NITROGEN       NITROGEN       NITROGEN       NITROGEN       NITROGEN       NITROGEN      PHOSPHORUS     DISCHARGE
                            DISSOLVED      DISSOLVED      DISSOLVED       TOTAL        PARTICULATE    PARTICULATE      TOTAL          INSTANT
                            NO3 & NO2       NITRITE       AMMONIA        KJELDAHL        TOTAL         (CALCD.)
                    SUBM        N              N              N              N              N              N              P
                     ID       MG/L           MG/L           MG/L           MG/L           MG/L           MG/L           MG/L           M3/S
SAMPLES(FLAGS)                 1(0)           1(0)           1(0)           1(0)           1(0)                          1(0)
           LOW                  .92            .47            .480          2.100           .88                           .365
          HIGH                  .92            .47            .480          2.100           .88                           .365
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
    MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE

                             10474L         10407L         10511L         10453L         14101L         97160S         97163S
                             RESIDUE        RESIDUE        RESIDUE        RESIDUE        SILICA       DISCHARGE      DISCHARGE
                              TOTAL      NONFILTRABLE     VOLATILE      FILTRABLE      REACTIVE        INSTANT         DAILY
                                                         NONFILTR.                                                     MEAN
                    SUBM                                  (CALCD.)                       SIO2
                     ID      MG/L           MG/L           MG/L           MG/L           MG/L           M3/S            CFS
SAMPLES(FLAGS)                 1(0)           1(0)                          1(0)           1(0)
           LOW                603.           203.                          430.            4.0
          HIGH                603.           203.                          430.            4.0
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
    MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE                                                                        02L

                             00205L         02074L         06537L         06524L         02001L         16101L         10701L         06608L
                             TOTAL         TURBIDITY      PHENOLIC       OIL AND         ODOUR         SULPHIDE       SURFACT.        CYANIDE
                            DISSOLVED                     MATERIAL       GREASE        THRESHOLD      DISSOLVED       N-ALKYL
                             SOLIDS                                                     NUMBER                       SULPHNTS.
                    SUBM                                   PHENOL                                         S              LAS            CN
                     ID       MG/L           NTU           MG/L           MG/L            TON           MG/L           MG/L           MG/L
SAMPLES(FLAGS)                 1(0)           1(0)           1(0)           1(0)                                         1(0)
           LOW                261.           100.0           .364           7.6                                           .40
          HIGH                261.           100.0           .364           7.6                                           .40
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
    MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
```

```
REQUEST 0007 -  0009 PAGE  27                     NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                    INDUSTRIAL MONITORING
STATION 20AL05EB1409    LAT. 53D 33M  6S  LONG. 113D 23M 38S   PR 3   UTM 12 341400E 5936100N  FOR JUN 20, 1983 TO JUN 20, 1983
IMPERIAL OIL LTD STRATHCONA               STORM WATER POND - EFFLUENT GRAB

                        08304L       08202L       06107L       06154L       06001L       06051L       06006L       06905L
                        OXYGEN       OXYGEN       CARBON       CARBON       CARBON       CARBON       CARBON       CARBON
                         TOTAL      BIOCHEM.     DISSOLVED    DISSOLVED     TOTAL        TOTAL       TOTAL      PARTICULATE
                          COD      DEMAND-BOD    ORGANIC      INORGANIC    ORGANIC     INORGANIC                  TOTAL
                  SUBM    02           02          C            C            C            C            C            C
                  ID    MG/L         MG/L        MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)           1(0)                     1(0)         1(0)                                               1(0)
           LOW           154.1                    31.0         15.0                                               8.30
          HIGH           154.1                    31.0         15.0                                               8.30
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
                        24101L       24009L       24302L       80015L       80011L       27009L       27302L       47304L
                       CHROMIUM     CHROMIUM     CHROMIUM     MERCURY      MERCURY      COBALT       COBALT       SILVER
                      HEXAVALENT     TOTAL       EXTRBLE.      TOTAL        TOTAL        TOTAL       EXTRBLE.     EXTRBLE.

                  SUBM    CR           CR           CR           HG           HG           CO           CO           AG
                  ID    MG/L         MG/L         MG/L         MG/L         UG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)           1(1)         1(0)                      1(1)                      1(0)
           LOW           L.001         .098                     L.0001                     .006
          HIGH           L.001         .098                     L.0001                     .006
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
                        29009L       29305L       28009L       28302L       48009L       48302L       82009L       82302L
                        COPPER       COPPER       NICKEL       NICKEL       CADMIUM      CADMIUM       LEAD         LEAD
                         TOTAL       EXTRBLE.     TOTAL        EXTRBLE.     TOTAL        EXTRBLE.     TOTAL        EXTRBLE.

                  SUBM    CU           CU           NI           NI           CD           CD           PB           PB
                  ID    MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)           1(0)                      1(0)                      1(1)                                 1(0)
           LOW           .018                       .041                     L.001                                 .008
          HIGH           .018                       .041                     L.001                                 .008
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
```

```
REQUEST 0010 -  0012 PAGE  28                        NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                       INDUSTRIAL MONITORING
STATION 20AL05EB1409    LAT. 53D 33M  6S  LONG. 113D 23M 38S   PR 3   UTM 12 341400E 5936100N  FOR JUN 20, 1983 TO JUN 20, 1983
IMPERIAL OIL LTD STRATHCONA                STORM WATER POND - EFFLUENT GRAB

                        30009L        30305L        25003L        25304L        23009L        42304L        42009L        51003L
                         ZINC          ZINC        MANGANESE     MANGANESE     VANADIUM     MOLYBDENUM    MOLYBDENUM    ANTIMONY
                         TOTAL       EXTRBLE.       TOTAL        EXTRBLE.       TOTAL        EXTRBLE.       TOTAL        TOTAL

                 SUBM     ZN            ZN            MN            MN            V             MO            MO           SB
                  ID     MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L         MG/L
SAMPLES(FLAGS)           1(0)                        1(0)                        1(0)                        1(1)
           LOW            .153                        .186                        .015                       L.001
          HIGH            .153                        .186                        .015                       L.001
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE

                        33005L        33104L        34005L        34102L        13111L        13306L        04102L        04304L
                        ARSENIC       ARSENIC      SELENIUM      SELENIUM      ALUMINUM      ALUMINUM      BERYLLIUM     BERYLLIUM
                        TOTAL        DISSOLVED     TOTAL         DISSOLVED     DISSOLVED     EXTRBLE.      DISSOLVED      EXTRBLE.

                 SUBM     AS            AS            SE            SE            AL            AL            BE            BE
                  ID     MG/L          MG/L          MG/L          MG/L          UG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)                                                                                 1(0)                        1(1)
           LOW                                                                                 4.090                       L.001
          HIGH                                                                                 4.090                       L.001
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  29                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB1800    LAT. 53D 33M  8S  LONG. 113D 22M 52S   PR 3   UTM 12 342250E 5936100N  FOR APR 28, 1980 TO APR 18, 1984
TEXACO CANADA LTD EDMONTON                   FINAL EFFLUENT GRAB
NW S31 T52 R23 W4M
                          02061F      10301L      10301F      10151L      10101L      02041L      97160S      97163S
                        TEMPERATURE     PH          PH       ALKALINITY  ALKALINITY  SPECIFIC   DISCHARGE   DISCHARGE
                        OF WATER                               PHENOL       TOTAL     CONDUCT.    INSTANT      DAILY
                                                             PHTHALEIN                                          MEAN
                  SUBM                                         CACO3       CACO3
                   ID     DEG.C      PH UNITS    PH UNITS      MG/L        MG/L       US/CM        M3/S        CFS
SAMPLES(FLAGS)            2(0)        3(0)                     3(0)        3(0)        3(0)                    3(0)
           LOW            44.0         7.3                       .0        94.2       1148.                     .78
          HIGH            48.0         7.5                       .0       141.        1613.                     .96
       AVERAGE            46.0                                   .0       111.7       1351.                     .8567
      STD.DEV.             2.8                                   .0        25.5        238.                     .0929
   PERCNT:10TH
          25TH
   MEDIAN 50TH            46.0        7.30                       .0       100.        1292.                     .83
          75TH
          90TH
SECONDARY CODE
                          06201L      06202L      06301L      20103L      20105L      10602L      10604L      97160S
                        BICARBONT.  BICARBONT.  CARBONATE    CALCIUM     CALCIUM    HARDNESS    HARDNESS   DISCHARGE
                          (CALCD.)    (CALCD.)    (CALCD.)   DISSOLVED   DISSOLVED    TOTAL       TOTAL      INSTANT
                                                                         (CALCD.)    (CALCD.)
                  SUBM    HCO3        HCO3        CO3          CA          CA        CACO3       CACO3
                   ID   MG/L          MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        M3/S
SAMPLES(FLAGS)            3(0)        1(0)        3(0)        2(0)        2(0)        2(0)        1(0)
           LOW            115.        115.          0.        69.0        69.0       258.8        296.
          HIGH            172.        115.          0.       110.         87.1       402.3        296.
       AVERAGE            136.                      0.        89.5        78.0       330.5
      STD.DEV.             31.                      0.        29.0        12.8       101.5
   PERCNT:10TH
          25TH
   MEDIAN 50TH            122.                      0.        89.5        78.0       330.5
          75TH
          90TH
SECONDARY CODE                                               10L
                          11103L      12102L      19103L      09107L      17203L      16306L      26009L      26304L
                          SODIUM    MAGNESIUM   POTASSIUM    FLUORIDE    CHLORIDE    SULPHATE      IRON        IRON
                        DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED     TOTAL      EXTRBLE.

                  SUBM     NA          MG          K           F           CL          SO4          FE          FE
                   ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            3(0)        3(0)        3(0)        3(0)        3(0)        3(0)                    3(0)
           LOW           119.0        19.         4.40        .240      165.00       148.                     .250
          HIGH           149.         31.         7.1         .34       290.         285.                     .72
       AVERAGE           135.3        23.7        5.47        .287      229.33       213.7                    .497
      STD.DEV.            15.2         6.4        1.44        .050       62.58        68.7                    .236
   PERCNT:10TH
          25TH
   MEDIAN 50TH           138.         21.0        4.9         .28       233.         208.0                    .52
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  30                        NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                       INDUSTRIAL MONITORING
STATION 20AL05EB1800    LAT. 53D 33M  8S  LONG. 113D 22M 52S   PR 3   UTM 12 342250E 5936100N  FOR APR 28, 1980 TO APR 18, 1984
TEXACO CANADA LTD EDMONTON              FINAL EFFLUENT GRAB
NW S31 T52 R23 W4M

                          07105L      07205L      07562L      07021L      07906L      07905L      15421L      97160S
                         NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN   PHOSPHORUS  DISCHARGE
                         DISSOLVED   DISSOLVED   DISSOLVED     TOTAL    PARTICULATE PARTICULATE   TOTAL      INSTANT
                         NO3 & NO2   NITRITE     AMMONIA     KJELDAHL     TOTAL      (CALCD.)
                  SUBM       N           N           N           N           N           N           P
                   ID      MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)             3(3)        3(3)        3(0)        2(0)        1(0)                    2(0)       M3/S
           LOW             L.05        L.05         .250       3.020        .82                     .850
          HIGH             L.050       L.050       3.950       3.600        .82                     .899
       AVERAGE                                     2.100       3.310                                .875
      STD.DEV.                                     1.850        .410                                .035
  PERCNT:10TH
          25TH
   MEDIAN 50TH             L.05        L.05        2.100       3.310                                .875
          75TH
          90TH
SECONDARY CODE                                     61L         15L                                 19L

                          10474L      10407L      10511L      10453L      14101L      97160S      97163S
                          RESIDUE     RESIDUE     RESIDUE     RESIDUE     SILICA     DISCHARGE   DISCHARGE
                           TOTAL   NONFILTRABLE   VOLATILE   FILTRABLE   REACTIVE     INSTANT      DAILY
                                               NONFILTR.                                         MEAN
                  SUBM                          (CALCD.)                  SIO2
                   ID      MG/L        MG/L        MG/L        MG/L        MG/L        M3/S        CFS
SAMPLES(FLAGS)             2(0)        3(0)                    1(0)        3(0)                    3(0)
           LOW            1013.        19.6                   1240.        3.90                     .78
          HIGH            1278.        38.                    1240.        8.1                      .96
       AVERAGE            1145.5       30.2                                5.87                     .8567
      STD.DEV.             187.4        9.5                                2.11                     .0929
  PERCNT:10TH
          25TH
   MEDIAN 50TH            1145.5       33.                                 5.6                      .83
          75TH
          90TH
SECONDARY CODE                                                         02L

                          00205L      02074L      06537L      06524L      02001L      16101L      10701L      06608L
                           TOTAL     TURBIDITY    PHENOLIC    OIL AND     ODOUR      SULPHIDE    SURFACT.     CYANIDE
                         DISSOLVED                MATERIAL    GREASE    THRESHOLD   DISSOLVED    N-ALKYL
                           SOLIDS                                        NUMBER                 SULPHNTS.
                  SUBM                            PHENOL                                 S          LAS          CN
                   ID      MG/L         NTU        MG/L        MG/L         TON        MG/L        MG/L        MG/L
SAMPLES(FLAGS)             3(0)        2(0)        3(0)        3(0)        3(0)        3(2)        2(0)
           LOW             643.2       25.0         .330       1.500         1.        L.02         .59
          HIGH             930.        25.5         .416       8.5        1000.         .08        1.12
       AVERAGE             763.7       25.3         .376       4.633       667.         .040*       .855
      STD.DEV.             148.8         .4         .043       3.557       577.         .035*       .375
  PERCNT:10TH
          25TH
   MEDIAN 50TH             718.        25.3         .381       3.9        1000.        L.020        .855
          75TH
          90TH
SECONDARY CODE                         73L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  31                        NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                      INDUSTRIAL MONITORING
STATION 20AL05EB1800    LAT. 53D 33M  8S  LONG. 113D 22M 52S   PR 3   UTM 12 342250E 5936100N  FOR APR 28, 1980 TO APR 18, 1984
TEXACO CANADA LTD EDMONTON                       FINAL EFFLUENT GRAB
NW S31 T52 R23 W4M

                          08304L       08202L       06107L       06154L       06001L       06051L       06006L       06905L
                          OXYGEN       OXYGEN       CARBON       CARBON       CARBON       CARBON       CARBON       CARBON
                           TOTAL       BIOCHEM.     DISSOLVED    DISSOLVED     TOTAL        TOTAL       TOTAL      PARTICULATE
                            COD        DEMAND-BOD   ORGANIC      INORGANIC     ORGANIC     INORGANIC                  TOTAL
                  SUBM      02            02          C            C            C            C            C            C
                   ID     MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)              3(0)                      1(0)         1(0)         1(0)         1(0)         1(0)         1(0)
           LOW              72.0                      12.0         27.0         29.          24.          53.          16.00
          HIGH              93.6                      12.0         27.0         29.          24.          53.          16.00
       AVERAGE              80.8
      STD.DEV.              11.4
   PERCNT:10TH
          25TH
   MEDIAN 50TH              76.7
          75TH
          90TH
SECONDARY CODE

                          24101L       24009L       24302L       80015L       80011L       27009L       27302L       47304L
                         CHROMIUM     CHROMIUM     CHROMIUM     MERCURY      MERCURY      COBALT       COBALT       SILVER
                        HEXAVALENT     TOTAL       EXTRBLE.      TOTAL        TOTAL        TOTAL       EXTRBLE.     EXTRBLE.

                  SUBM      CR           CR           CR           HG           HG           CO           CO           AG
                   ID     MG/L         MG/L         MG/L         MG/L         UG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)             3(1)         3(0)                       3(2)                      3(2)
           LOW             L.001         .025                      L.0001                    L.001
          HIGH              .006         .968                       .0002                     .03
       AVERAGE              .003*        .393                       .0001*                    .011*
      STD.DEV.              .003*        .504                       .0001*                    .017*
   PERCNT:10TH
          25TH
   MEDIAN 50TH              .003         .187                      L.0001                    L.001
          75TH
          90TH
SECONDARY CODE

                          29009L       29305L       28009L       28302L       48009L       48302L       82009L       82302L
                          COPPER       COPPER       NICKEL       NICKEL       CADMIUM      CADMIUM      LEAD         LEAD
                           TOTAL       EXTRBLE.      TOTAL       EXTRBLE.      TOTAL       EXTRBLE.     TOTAL        EXTRBLE.

                  SUBM      CU           CU           NI           NI           CD           CD           PB           PB
                   ID     MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)              3(0)                      3(0)                      3(2)                                   2(1)
           LOW              .003                      .011                      L.001                                  L.003
          HIGH              .012                      .013                       .002                                   .005
       AVERAGE              .006                      .012                       .001*                                  .004*
      STD.DEV.              .005                      .001                       .001*                                  .001*
   PERCNT:10TH
          25TH
   MEDIAN 50TH              .004                      .011                      L.001                                   .004*
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0010 -  0012 PAGE  32                      NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                      INDUSTRIAL MONITORING
STATION 20AL05EB1800    LAT. 53D 33M  8S  LONG. 113D 22M 52S   PR 3   UTM 12 342250E 5936100N  FOR APR 28, 1980 TO APR 18, 1984
TEXACO CANADA LTD EDMONTON              FINAL EFFLUENT GRAB
NW S31 T52 R23 W4M

                          30009L       30305L       25003L       25304L       23009L       42304L       42009L       51003L
                           ZINC         ZINC      MANGANESE    MANGANESE     VANADIUM    MOLYBDENUM   MOLYBDENUM   ANTIMONY
                          TOTAL       EXTRBLE.      TOTAL      EXTRBLE.       TOTAL      EXTRBLE.       TOTAL       TOTAL

                    SUBM    ZN           ZN           MN           MN           V            MO           MO          SB
                     ID    MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L        MG/L
SAMPLES(FLAGS)             3(0)                      3(0)                      2(0)                      2(0)
           LOW              .012                      .056                      .004                      .005
          HIGH              .190                      .079                      .006                      .036
       AVERAGE              .102                      .068                      .005                      .021
      STD.DEV.              .089                      .012                      .001                      .022
  PERCNT:10TH
          25TH
    MEDIAN 50TH             .104                      .068                      .005                      .021

SECONDARY CODE

                          33005L       33104L       34005L       34102L       13111L       13306L       04102L       04304L
                          ARSENIC      ARSENIC     SELENIUM     SELENIUM     ALUMINUM     ALUMINUM    BERYLLIUM    BERYLLIUM
                         TOTAL       DISSOLVED    TOTAL        DISSOLVED    DISSOLVED    EXTRBLE.     DISSOLVED     EXTRBLE.

                    SUBM    AS           AS           SE           SE           AL           AL           BE           BE
                     ID    MG/L         MG/L         MG/L         MG/L         UG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)             1(0)                      1(1)                                   2(0)                      2(2)
           LOW             .0018                     L.0002                                 1.170                     L.001
          HIGH             .0018                     L.0002                                 3.380                     L.001
       AVERAGE                                                                              2.275
      STD.DEV.                                                                              1.563
  PERCNT:10TH
          25TH
    MEDIAN 50TH                                                                             2.275                     L.001
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  33                      NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                    INDUSTRIAL MONITORING
STATION 20AL05EB1805    LAT. 53D 33M  8S  LONG. 113D 22M 52S   PR 3   UTM 12 342250E 5936100N  FOR JUN 15, 1981 TO DEC 04, 1981
TEXACO CANADA LTD EDMONTON            DAF INFLUENT GRAB
NW S31 T52 R23 W4M
                           02061F       10301L       10301F       10151L       10101L       02041L       971605       971635
                         TEMPERATURE      PH           PH       ALKALINITY   ALKALINITY   SPECIFIC    DISCHARGE    DISCHARGE
                          OF WATER                                PHENOL       TOTAL      CONDUCT.     INSTANT      DAILY
                                                                PHTHALEIN                                           MEAN
                    SUBM                                          CACO3        CACO3
                     ID    DEG.C      PH UNITS     PH UNITS       MG/L         MG/L        US/CM        M3/S         CFS
SAMPLES(FLAGS)             8(0)         9(0)         4(0)         9(0)         9(0)        9(0)                     9(0)
           LOW             37.0          6.7          7.3           .0         113.        1004.                      .58
          HIGH             50.0          7.7          7.8           .0         139.        2940.                     1.34
       AVERAGE             44.9                                     .0         124.7       1486.                     1.0600
      STD.DEV.              4.2                                     .0          10.1        707.                      .2789
   PERCNT:10TH
          25TH             43.3          7.1          7.45          .0         115.        1020.                      .82
   MEDIAN 50TH             44.5          7.3          7.65          .0         121.        1125.                     1.12
          75TH             48.5          7.5          7.75          .0         132.        1720.                     1.33
          90TH
SECONDARY CODE

                           06201L       06202L       06301L       20103L       20105L       10602L       10604L       971605
                          BICARBONT.   BICARBONT.   CARBONATE    CALCIUM      CALCIUM     HARDNESS     HARDNESS    DISCHARGE
                           (CALCD.)     (CALCD.)     (CALCD.)    DISSOLVED    DISSOLVED     TOTAL        TOTAL       INSTANT
                                                                              (CALCD.)    (CALCD.)
                    SUBM    HCO3         HCO3         CO3          CA           CA          CACO3        CACO3
                     ID    MG/L          MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         M3/S
SAMPLES(FLAGS)             9(0)                       9(0)         9(0)         4(0)                      9(0)
           LOW             138.                        0.          51.          50.9                     185.
          HIGH             169.                        0.         132.          67.8                     442.
       AVERAGE             152.                        0.          86.9         61.8                     307.8
      STD.DEV.              12.                        0.          29.3          7.5                      85.3
   PERCNT:10TH
          25TH             140.                        0.          66.          56.8                     251.
   MEDIAN 50TH             147.                        0.          85.          64.2                     312.
          75TH             161.                        0.         104.          66.8                     353.
          90TH
SECONDARY CODE                                                    11L

                           11103L       12102L       19103L       09107L       17203L       16306L       26009L       26304L
                           SODIUM      MAGNESIUM    POTASSIUM    FLUORIDE     CHLORIDE     SULPHATE      IRON         IRON
                          DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED     TOTAL       EXTRBLE.

                    SUBM     NA           MG           K            F            CL           SO4          FE           FE
                     ID    MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)             9(0)         9(0)         9(0)         9(0)         9(0)         9(0)         5(0)         4(0)
           LOW              86.          13.          2.8          .31         101.          80.          .09          .10
          HIGH             484.          27.          8.2          .46         860.         223.         1.01         1.18
       AVERAGE             181.2         21.7         4.49         .348        292.78       170.4         .546         .525
      STD.DEV.             148.2          5.5         2.03         .050        274.76        45.8         .374         .466
   PERCNT:10TH
          25TH              91.          19.          3.0          .32         126.         145.          .30          .210
   MEDIAN 50TH              93.          21.          3.3          .32         135.         189.          .51          .410
          75TH             240.          27.          5.5          .34         369.         196.          .82          .840
          90TH
SECONDARY CODE             11L          11L          11L          06L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,6 OR Q
```

```
REQUEST 0004 -  0006 PAGE  34                     NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB1805    LAT. 53D 33M  8S  LONG. 113D 22M 52S   PR 3   UTM 12 342250E 5936100N  FOR JUN 15, 1981 TO DEC 04, 1981
TEXACO CANADA LTD EDMONTON                DAF INFLUENT GRAB
NW S31 T52 R23 W4M
                      07105L        07205L        07562L        07021L        07906L        07905L        15421L        97160S
                      NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN      PHOSPHORUS    DISCHARGE
                      DISSOLVED     DISSOLVED     DISSOLVED     TOTAL         PARTICULATE   PARTICULATE   TOTAL         INSTANT
                      NO3 & NO2     NITRITE       AMMONIA       KJELDAHL      TOTAL         (CALCD.)
               SUBM   N             N             N             N             N             N             P
               ID     MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          M3/S
SAMPLES(FLAGS)             9(4)          9(7)          9(0)          9(0)          4(0)                        9(0)
           LOW              .04          L.02           .45           1.7            .7                         .06
          HIGH              .07          L.05           4.0         5.000           1.1                        .800
       AVERAGE            .049*         .036*         1.998         3.639          .950                        .529
      STD.DEV.            .009*         .015*         1.062         1.209          .191                        .269
   PERCNT:10TH
          25TH              .04          L.02           1.1           3.2          .800                         .28
   MEDIAN 50TH             L.05           .04         2.200           4.0         1.000                        .600
          75TH             L.05          L.05         2.400         4.500         1.100                         .77
          90TH
SECONDARY CODE                                      61L           15L                                       19L
                      10474L        10407L        10511L        10453L        14101L        97160S        97163S
                      RESIDUE       RESIDUE       RESIDUE       RESIDUE       SILICA        DISCHARGE     DISCHARGE
                      TOTAL         NONFILTRABLE  VOLATILE      FILTRABLE     REACTIVE      INSTANT       DAILY
                                                  NONFILTR.                                               MEAN
               SUBM                               (CALCD.)                    SIO2
               ID     MG/L          MG/L          MG/L          MG/L          MG/L          M3/S          CFS
SAMPLES(FLAGS)             9(0)          9(0)                        4(0)          9(0)                        9(0)
           LOW             566.           26.                        530.           4.7                         .58
          HIGH            1878.           64.                        640.           8.0                        1.34
       AVERAGE            962.9          43.0                       570.0          6.14                      1.0600
      STD.DEV.            489.0          10.6                        49.7          1.20                       .2789
   PERCNT:10TH
          25TH             618.          38.0                       535.0           5.3                         .82
   MEDIAN 50TH             740.          43.0                       555.0           6.0                        1.12
          75TH            1174.           48.                       605.0           6.4                        1.33
          90TH
SECONDARY CODE          71L           01L                                       02L
                      00205L        02074L        06537L        06524L        02001L        16101L        10701L        06608L
                      TOTAL         TURBIDITY     PHENOLIC      OIL AND       ODOUR         SULPHIDE      SURFACT.      CYANIDE
                      DISSOLVED                   MATERIAL      GREASE        THRESHOLD     DISSOLVED     N-ALKYL
                      SOLIDS                                                  NUMBER                      SULPHNTS.
               SUBM                               PHENOL                                    S             LAS           CN
               ID     MG/L          NTU           MG/L          MG/L          TON           MG/L          MG/L          MG/L
SAMPLES(FLAGS)             9(0)          9(0)          9(0)          9(0)          8(0)          9(2)
           LOW             443.           7.7           .02           8.6            2.          L.05
          HIGH            1806.          24.0          .255          62.0          100.          3.08
       AVERAGE            877.3          14.8          .140        18.244           33.        1.090*
      STD.DEV.            497.4           6.4          .095        16.652           42.         .965*
   PERCNT:10TH
          25TH             530.           7.8          .079          11.7           10.           .52
   MEDIAN 50TH             692.          14.0           .10          13.2           10.           .81
          75TH            1086.          20.0          .250          16.5           60.          1.44
          90TH
SECONDARY CODE                                                    21L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  35                         NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                        INDUSTRIAL MONITORING
STATION 20AL05EB1805    LAT. 53D 33M  8S  LONG. 113D 22M 52S   PR 3   UTM 12 342250E 5936100N  FOR JUN 15, 1981 TO DEC 04, 1981
TEXACO CANADA LTD EDMONTON                    DAF INFLUENT GRAB
NW S31 T52 R23 W4M

                          08304L      08202L      06107L      06154L      06001L      06051L      06006L      06905L
                          OXYGEN      OXYGEN      CARBON      CARBON      CARBON      CARBON      CARBON      CARBON
                            TOTAL     BIOCHEM.    DISSOLVED   DISSOLVED    TOTAL       TOTAL     TOTAL       PARTICULATE
                              COD    DEMAND-BOD   ORGANIC     INORGANIC   ORGANIC    INORGANIC                 TOTAL
                 SUBM     02             02        C           C           C           C           C           C
                  ID      MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)              9(0)                    4(0)        4(0)        5(0)                                4(0)
           LOW              83.                     20.         38.         15.6                                10.
          HIGH              309.                    23.         45.         39.0                                18.
       AVERAGE              162.8                   21.00       42.25       25.62                               13.50
      STD.DEV.               81.0                    1.41        3.10        9.21                                3.42
   PERCNT:10TH
          25TH              116.3                   20.00       40.00       21.4                                11.00
   MEDIAN 50TH              124.4                   20.50       43.00       21.5                                13.00
          75TH              196.                    22.00       44.50       30.6                                16.00
          90TH
SECONDARY CODE            01L                                               07L

                          24101L      24009L      24302L      80015L      80011L      27009L      27302L      47304L
                          CHROMIUM    CHROMIUM    CHROMIUM    MERCURY     MERCURY     COBALT      COBALT      SILVER
                          HEXAVALENT  TOTAL        EXTRBLE.   TOTAL       TOTAL       TOTAL       EXTRBLE.    EXTRBLE.

                 SUBM     CR          CR          CR          HG          HG          CO          CO          AG
                  ID      MG/L        MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            9(8)        9(0)                     9(0)                    9(8)                     5(5)
           LOW            L.001        .07                     .0002                   L.001                    L.02
          HIGH             .01         .53                     .0006                   L.01                     L.02
       AVERAGE             .006*       .286                    .0003                    .006*
      STD.DEV.             .005*       .133                    .0001                    .005*
   PERCNT:10TH
          25TH            L.001        .256                    .0002                   L.001                    L.02
   MEDIAN 50TH            L.01         .277                    .0003                   L.01                     L.02
          75TH            L.01         .35                     .0003                   L.01                     L.02
          90TH
SECONDARY CODE

                          29009L      29305L      28009L      28302L      48009L      48302L      82009L      82302L
                          COPPER      COPPER      NICKEL      NICKEL      CADMIUM     CADMIUM     LEAD        LEAD
                           TOTAL      EXTRBLE.    TOTAL       EXTRBLE.    TOTAL       EXTRBLE.    TOTAL       EXTRBLE.

                 SUBM     CU          CU          NI          NI          CD          CD          PB          PB
                  ID      MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            9(2)                    9(4)                    9(9)                    4(0)        5(3)
           LOW            L.005                    .006                   L.001                    .008       L.02
          HIGH             .016                    .04                    L.01                     .009        .03
       AVERAGE             .010*                   .017*                                           .009        .022*
      STD.DEV.             .004*                   .011*                                           .001        .004*
   PERCNT:10TH
          25TH             .006                    .008                   L.001                    .008       L.02
   MEDIAN 50TH             .010                   L.02                    L.01                     .009       L.02
          75TH             .013                   L.02                    L.01                     .009        .02
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0010 -  0012 PAGE  36                   NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                 INDUSTRIAL MONITORING
STATION 20AL05EB1805    LAT. 53D 33M  8S  LONG. 113D 22M 52S   PR 3   UTM 12 342250E 5936100N  FOR JUN 15, 1981 TO DEC 04, 1981
TEXACO CANADA LTD EDMONTON                    DAF INFLUENT GRAB
NW S31 T52 R23 W4M

                         30009L       30305L      25003L      25304L      23009L      42304L      42009L      51003L
                          ZINC         ZINC      MANGANESE   MANGANESE   VANADIUM   MOLYBDENUM  MOLYBDENUM   ANTIMONY
                          TOTAL      EXTRBLE.     TOTAL      EXTRBLE.     TOTAL      EXTRBLE.     TOTAL       TOTAL

                 SUBM      ZN          ZN          MN          MN          V           MO          MO          SB
                  ID      MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            9(0)                    9(0)                    5(3)                    5(5)        5(0)
           LOW             .06                     .031                   L.01                    L.02        .0024
          HIGH             .139                    .068                    .06                    L.02        .006
       AVERAGE             .101                    .046                    .020*                              .0037
      STD.DEV.             .028                    .012                    .022*                              .0014
   PERCNT:10TH
          25TH             .08                     .039                   L.01                    L.02        .003
   MEDIAN 50TH             .11                     .043                   L.01                    L.02        .003
          75TH             .12                     .052                    .01                    L.02        .004
          90TH
SECONDARY CODE

                         33005L       33104L      34005L      34102L      13111L      13306L      04102L      04304L
                         ARSENIC      ARSENIC    SELENIUM    SELENIUM    ALUMINUM    ALUMINUM    BERYLLIUM   BERYLLIUM
                         TOTAL       DISSOLVED   TOTAL       DISSOLVED   DISSOLVED   EXTRBLE.    DISSOLVED    EXTRBLE.

                 SUBM      AS          AS          SE          SE          AL          AL          BE          BE
                  ID      MG/L        MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            5(1)                    5(0)                    5(0)                    5(4)
           LOW            L.001                    .001                   110.                    L.005
          HIGH             .007                    .011                  1720.                     .005
       AVERAGE             .0026*                  .0044                 1172.80                   .005*
      STD.DEV.             .0026*                  .0040                  651.27                   .000*
   PERCNT:10TH
          25TH             .001                    .002                  1164.                    L.005
   MEDIAN 50TH             .001                    .003                  1180.                    L.005
          75TH             .003                    .005                  1690.                    L.005
          90TH
SECONDARY CODE                                    07L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  37                   NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                  INDUSTRIAL MONITORING
STATION 20AL05EB1806    LAT. 53D 33M  8S  LONG. 113D 22M 52S   PR 3   UTM 12 342250E 5936100N  FOR JUN 16, 1981 TO DEC 03, 1981
TEXACO CANADA LTD EDMONTON                         DAF INFLUENT COMP.
NW S31 T52 R23 W4M

                          02061F       10301L      10301F      10151L       10101L      02041L      97160S      97163S
                        TEMPERATURE      PH          PH      ALKALINITY   ALKALINITY   SPECIFIC   DISCHARGE   DISCHARGE
                         OF WATER                              PHENOL       TOTAL      CONDUCT.    INSTANT      DAILY
                 SUBM                                         PHTHALEIN                                         MEAN
                  ID       DEG.C      PH UNITS    PH UNITS      CACO3        CACO3
                                                                MG/L         MG/L       US/CM       M3/S        CFS
SAMPLES(FLAGS)             1(0)        6(0)        3(0)         6(0)         6(0)       6(0)                    6(0)
           LOW             27.0        7.0         7.4           .0          110.       1015.                    .76
          HIGH             27.0        7.5         7.6           .0          134.       2910.                   1.34
       AVERAGE                                                   .0          122.3      1623.                   1.0883
      STD.DEV.                                                   .0           11.5       873.                    .2481
  PERCNT:10TH
          25TH                         7.0                       .0          111.       1058.                    .82
   MEDIAN 50TH                         7.30        7.5           .0          123.5      1091.                   1.1400
          75TH                         7.4                       .0          132.       2570.                   1.33
          90TH
SECONDARY CODE

                          06201L      06202L      06301L      20103L       20105L      10602L      10604L      97160S
                        BICARBONT.  BICARBONT.  CARBONATE     CALCIUM      CALCIUM    HARDNESS    HARDNESS   DISCHARGE
                         (CALCD.)    (CALCD.)    (CALCD.)    DISSOLVED    DISSOLVED     TOTAL       TOTAL      INSTANT
                                                                           (CALCD.)    (CALCD.)
                 SUBM      HCO3        HCO3        CO3          CA           CA         CACO3       CACO3
                  ID       MG/L        MG/L        MG/L         MG/L         MG/L        MG/L        MG/L       M3/S
SAMPLES(FLAGS)             6(0)                    6(0)         6(0)         3(0)                    6(0)
           LOW             134.                     0.          46.          45.9                    189.
          HIGH             163.                     0.          129.         66.7                    432.
       AVERAGE             149.                     0.           85.3        57.1                    302.0
      STD.DEV.              14.                     0.           35.3        10.5                     96.2
  PERCNT:10TH
          25TH             135.                     0.          59.                                  225.
   MEDIAN 50TH             151.                     0.           79.0        58.7                    294.5
          75TH             161.                     0.          120.                                 377.
          90TH
SECONDARY CODE                                                  11L

                          11103L      12102L      19103L      09107L       17203L      16306L      26009L      26304L
                          SODIUM     MAGNESIUM   POTASSIUM    FLUORIDE     CHLORIDE    SULPHATE      IRON        IRON
                         DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED    DISSOLVED   DISSOLVED     TOTAL      EXTRBLE.
                 SUBM
                  ID       NA          MG          K            F            CL          SO4         FE          FE
                           MG/L        MG/L        MG/L         MG/L         MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)             6(0)        6(0)        6(0)         6(0)         6(0)        6(0)        3(0)        3(0)
           LOW             86.         18.         2.8          .18          118.        125.         .35         .15
          HIGH             472.        27.         8.1          .34          843.        276.         .54         .32
       AVERAGE             209.7       21.0        4.67         .288         354.83      184.8        .450        .223
      STD.DEV.             184.2        3.6        2.28         .059         338.69       56.1        .095        .087
  PERCNT:10TH
          25TH             90.         19.         2.9          .26          125.        140.
   MEDIAN 50TH             94.5        19.0        3.70         .315         154.00      179.5        .46         .20
          75TH             421.        24.         6.8          .32          735.        209.
          90TH
SECONDARY CODE             11L         11L         11L          06L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  38                     NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB1806    LAT. 53D 33M  8S  LONG. 113D 22M 52S   PR 3   UTM 12 342250E 5936100N  FOR JUN 16, 1981 TO DEC 03, 1981
TEXACO CANADA LTC EDMONTON                DAF INFLUENT COMP.
NW S31 T52 R23 W4M
                       07105L        07205L        07562L        07021L        07906L        07905L        15421L        97160S
                     NITROGEN      NITROGEN      NITROGEN       NITROGEN      NITROGEN      NITROGEN     PHOSPHORUS    DISCHARGE
                      DISSOLVED     DISSOLVED     DISSOLVED       TOTAL      PARTICULATE   PARTICULATE     TOTAL          INSTANT
                      NO3 & NO2      NITRITE      AMMONIA       KJELDAHL       TOTAL         (CALCD.)
               SUBM        N             N             N            N             N             N                P
                ID     MG/L           MG/L          MG/L          MG/L          MG/L         MG/L           MG/L          M3/S
SAMPLES(FLAGS)           6(3)          6(6)          6(0)         6(0)          3(0)                         6(0)
           LOW            .04          L.02           .17          1.0           1.5                          .45
          HIGH            .05          L.05         1.700        5.000           2.1                         .800
       AVERAGE            .048*                      .823        2.888         1.833                         .607
      STD.DEV.            .004*                      .565        1.765          .306                         .152
   PERCNT:10TH
          25TH           L.05          L.02           .28          1.0                                        .47
   MEDIAN 50TH          L.050         L.035          .860        2.815           1.9                         .570
          75TH            .05          L.05          1.07        4.700                                       .780
          90TH
SECONDARY CODE                                     61L           15L                                       19L
                       10474L        10407L        10511L        10453L        14101L       97160S        97163S
                      RESIDUE       RESIDUE       RESIDUE       RESIDUE         SILICA      DISCHARGE     DISCHARGE
                       TOTAL     NONFILTRABLE     VOLATILE     FILTRABLE      REACTIVE       INSTANT        DAILY
                                                 NONFILTR.                                                  MEAN
               SUBM                              (CALCD.)                      SIO2
                ID     MG/L           MG/L          MG/L          MG/L         MG/L          M3/S           CFS
SAMPLES(FLAGS)           6(0)          6(0)                        3(0)         6(0)                        6(0)
           LOW           608.          34.6                        560.          5.0                         .76
          HIGH          1804.           51.                        640.          7.0                        1.34
       AVERAGE         1044.5          44.3                       596.7         5.87                      1.0883
      STD.DEV.          547.1           5.7                        40.4          .84                       .2481
   PERCNT:10TH
          25TH           632.          42.                                       5.2                         .82
   MEDIAN 50TH          773.5          45.0                        590.         5.80                      1.1400
          75TH          1676.          48.                                       6.4                        1.33
          90TH
SECONDARY CODE         71L           01L                                       02L
                       00205L        02074L        06537L        06524L        02001L       16101L        10701L         06608L
                       TOTAL        TURBIDITY       PHENOLIC     OIL AND         ODOUR        SULPHIDE       SURFACT.        CYANIDE
                      DISSOLVED                     MATERIAL    GREASE        THRESHOLD     DISSOLVED     N-ALKYL
                       SOLIDS                                                  NUMBER                     SULPHNTS.
               SUBM                                 PHENOL                                      S             LAS            CN
                ID     MG/L           NTU           MG/L         MG/L            TON         MG/L          MG/L           MG/L
SAMPLES(FLAGS)           6(0)          6(0)          6(0)          6(0)          6(0)
           LOW           486.          12.0          .058        13.6              2.
          HIGH          1800.          35.0          .240        28.9             10.
       AVERAGE          958.0          23.8          .126       20.600             9.
      STD.DEV.          610.3           8.6          .074        5.899             3.
   PERCNT:10TH
          25TH           522.          18.0          .069        14.9             10.
   MEDIAN 50TH          635.0          24.0          .097       20.500            10.
          75TH          1670.          30.0          .195        25.2             10.
          90TH
SECONDARY CODE                                                   21L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  39                     NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB1806    LAT. 53D 33M  8S  LONG. 113D 22M 52S   PR 3   UTM 12 342250E 5936100N  FOR JUN 16, 1981 TO DEC 03, 1981
TEXACO CANADA LTD EDMONTON               DAF INFLUENT COMP.
NW S31 T52 R23 W4M

                        08304L       08202L       06107L       06154L       06001L       06051L       06006L       06905L
                        OXYGEN       OXYGEN       CARBON       CARBON       CARBON       CARBON       CARBON       CARBON
                         TOTAL      BIOCHEM.     DISSOLVED    DISSOLVED     TOTAL        TOTAL       TOTAL       PARTICULATE
                          COD      DEMAND-BOD     ORGANIC     INORGANIC     ORGANIC     INORGANIC                   TOTAL
                SUBM      02            O2          C            C            C            C            C            C
                 ID      MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)           6(0)                      3(0)         3(0)         3(0)                                   3(0)
           LOW           32.                       20.          44.          32.6                                   19.
          HIGH           176.                      24.          45.          38.6                                   27.
       AVERAGE           118.8                     22.00        44.67        34.77                                  23.00
      STD.DEV.            62.8                      2.00          .58         3.33                                   4.00
   PERCNT:10TH
          25TH           46.0
   MEDIAN 50TH           148.4                     22.          45.          33.1                                   23.
          75TH           162.0
          90TH
SECONDARY CODE          01L                                                07L

                        24101L       24009L       24302L       80015L       80011L       27009L       27302L       47304L
                       CHROMIUM     CHROMIUM     CHROMIUM     MERCURY      MERCURY      COBALT       COBALT       SILVER
                      HEXAVALENT    TOTAL         EXTRBLE.    TOTAL        TOTAL        TOTAL        EXTRBLE.     EXTRBLE.

                SUBM      CR           CR           CR           HG           HG           CO           CO           AG
                 ID      MG/L         MG/L         MG/L         MG/L         UG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)           6(3)         6(0)                      6(0)                      6(3)                      3(3)
           LOW            .005         .25                       .0001                     .002                     L.02
          HIGH            .010         .354                      .0007                    L.01                      L.02
       AVERAGE            .008*        .288                      .0003                     .006*
      STD.DEV.            .002*        .047                      .0002                     .004*
   PERCNT:10TH
          25TH            .006         .251                      .0002                     .003
   MEDIAN 50TH           L.010         .265                      .0003                     .007*                    L.02
          75TH           L.01          .341                      .0005                    L.01
          90TH
SECONDARY CODE

                        29009L       29305L       28009L       28302L       48009L       48302L       82009L       82302L
                        COPPER       COPPER       NICKEL       NICKEL       CADMIUM      CADMIUM       LEAD         LEAD
                         TOTAL       EXTRBLE.     TOTAL        EXTRBLE.     TOTAL        EXTRBLE.     TOTAL        EXTRBLE.

                SUBM      CU           CU           NI           NI           CD           CD           PB           PB
                 ID      MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)           6(0)                      6(3)                      6(6)                      3(0)         3(3)
           LOW            .015                      .009                    L.001                       .013        L.02
          HIGH            .035                     L.02                     L.01                        .015        L.02
       AVERAGE            .024                      .016*                                               .014
      STD.DEV.            .009                      .005*                                               .001
   PERCNT:10TH
          25TH            .015                      .011                    L.001
   MEDIAN 50TH            .023                      .017*                   L.005                       .013        L.02
          75TH            .034                     L.02                     L.01
          90TH
SECONDARY CODE
```

```
REQUEST 0010 -  0012 PAGE  40                     NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                    INDUSTRIAL MONITORING
STATION 20AL05EB1806    LAT. 53D 33M  8S  LONG. 113D 22M 52S   PR 3   UTM 12 342250E 5936100N  FOR JUN 16, 1981 TO DEC 03, 1981
TEXACO CANADA LTD EDMONTON                DAF INFLUENT COMP.
NW S31 T52 R23 W4M

                            30009L       30305L       25003L       25304L       23009L       42304L       42009L       51003L
                             ZINC         ZINC       MANGANESE    MANGANESE    VANADIUM    MOLYBDENUM   MOLYBDENUM    ANTIMONY
                             TOTAL       EXTRBLE.      TOTAL       EXTRBLE.      TOTAL       EXTRBLE.      TOTAL        TOTAL

                 SUBM         ZN           ZN           MN           MN           V            MO           MO           SB
                  ID         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)               6(0)                      6(0)                      3(3)                      3(3)         3(0)
           LOW                .10                       .034                     L.01                      L.02         .003
          HIGH                .187                      .059                     L.01                      L.02         .005
       AVERAGE                .152                      .043                                                            .0040
      STD.DEV.                .034                      .009                                                            .0010
  PERCNT:10TH
          25TH                .13                       .036
   MEDIAN 50TH                .158                      .040                     L.01                      L.02         .004
          75TH                .179                      .047
          90TH
SECONDARY CODE
                            33005L       33104L       34005L       34102L       13111L       13306L       04102L       04304L
                            ARSENIC      ARSENIC     SELENIUM     SELENIUM     ALUMINUM     ALUMINUM    BERYLLIUM    BERYLLIUM
                            TOTAL       DISSOLVED    TOTAL        DISSOLVED    DISSOLVED    EXTRBLE.     DISSOLVED     EXTRBLE.

                 SUBM         AS           AS           SE           SE           AL           AL           BE           BE
                  ID         MG/L         MG/L         MG/L         MG/L         UG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)               3(0)                      3(0)                      3(0)                      3(3)
           LOW               .001                      .001                     1200.                      L.005
          HIGH               .004                      .003                     2100.                      L.005
       AVERAGE               .0023                     .0017                    1573.33
      STD.DEV.               .0015                     .0012                     469.18
  PERCNT:10TH
          25TH
   MEDIAN 50TH               .002                      .001                     1420.                      L.005
          75TH
          90TH
SECONDARY CODE                                         07L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  41                   NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                  INDUSTRIAL MONITORING
STATION 20AL05EB1807    LAT. 53D 33M  8S  LONG. 113D 22M 52S   PR 3   UTM 12 342250E 5936100N  FOR JUN 15, 1981 TO AUG 17, 1983
TEXACO CANADA LTD EDMONTON                DAF EFFLUENT GRAB
NW S31 T52 R23 W4M

                      02061F      10301L      10301F      10151L      10101L      02041L      97160S      97163S
                   TEMPERATURE      PH          PH      ALKALINITY  ALKALINITY   SPECIFIC   DISCHARGE   DISCHARGE
                   OF WATER                               PHENOL      TOTAL     CONDUCT.    INSTANT      DAILY
                                                        PHTHALEIN                                         MEAN
                SUBM                                      CACO3       CACO3
                 ID   DEG.C      PH UNITS    PH UNITS     MG/L        MG/L        US/CM       M3/S         CFS
SAMPLES(FLAGS)        16(0)       17(0)       4(0)       17(0)       17(0)       17(0)                   16(0)
           LOW         16.0         6.3        6.4          .0         68.        535.                     .58
          HIGH         48.0         7.7        7.2          .0        130.       3030.                    1.40
       AVERAGE         40.9                                 .0         97.9      1325.                    1.0700
      STD.DEV.          7.4                                 .0         18.5       570.                     .2647
   PERCNT:10TH         37.0         6.8                     .0         73.        989.                     .73
          25TH         39.0         7.0        6.60         .0         81.       1054.                     .7950
    MEDIAN 50TH        43.0         7.1        6.80         .0        100.       1151.                    1.1400
          75TH         44.5         7.3        7.00         .0        106.       1413.                    1.3200
          90TH         47.0         7.3                     .0        127.       2330.                    1.34
SECONDARY CODE

                      06201L      06202L      06301L      20103L      20105L      10602L      10604L      97160S
                   BICARBONT.  BICARBONT.   CARBONATE    CALCIUM     CALCIUM    HARDNESS    HARDNESS   DISCHARGE
                    (CALCD.)    (CALCD.)    (CALCD.)    DISSOLVED   DISSOLVED     TOTAL       TOTAL      INSTANT
                                                                     (CALCD.)    (CALCD.)
                SUBM   HCO3        HCO3        CO3          CA          CA        CACO3       CACO3
                 ID   MG/L         MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        M3/S
SAMPLES(FLAGS)        17(0)        2(0)       17(0)       17(0)        4(0)        8(0)        9(0)
           LOW          83.        122.          0.         44.         43.7       184.1       167.
          HIGH         158.        158.          0.        127.         72.9       391.4       432.
       AVERAGE         119.        140.          0.         80.6        59.3       280.8       310.1
      STD.DEV.          23.         25.          0.         23.0        12.3        59.8        92.3
   PERCNT:10TH          89.                      0.         49.
          25TH          99.                      0.         64.         50.2       255.4       246.
    MEDIAN 50TH        122.        140.          0.         78.         60.2       270.1       309.
          75TH         129.                      0.         96.         68.3       309.7       367.
          90TH         155.                      0.        118.
SECONDARY CODE                                       11L 10L

                      11103L      12102L      19103L      09107L      17203L      16306L      26009L      26304L
                      SODIUM    MAGNESIUM   POTASSIUM    FLUORIDE    CHLORIDE    SULPHATE      IRON        IRON
                    DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED     TOTAL      EXTRBLE.

                SUBM    NA          MG          K           F           CL          SO4          FE          FE
                 ID    MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)        17(0)       17(0)       17(0)       17(0)       17(0)       17(0)        5(0)       12(1)
           LOW          32.         14.         1.8         .14         21.         95.         .09        L.02
          HIGH         487.         33.         8.4         .46        847.        300.        2.33         .72
       AVERAGE         148.5        23.1        4.51        .279       215.18      224.4        .632        .258*
      STD.DEV.         111.5         5.5        1.99        .089       203.95       57.7        .952        .217*
   PERCNT:10TH          87.         15.         2.8         .16         98.        140.                     .06
          25TH          92.         20.         3.0         .23        126.        190.         .20         .100
    MEDIAN 50TH        117.         22.         3.4         .26        145.        240.         .27         .175
          75TH         159.         26.         5.7         .32        205.        258.         .27         .390
          90TH         361.         32.         7.8         .42        610.        295.                     .56
SECONDARY CODE         11L         11L         11L         06L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  42                        NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                      INDUSTRIAL MONITORING
STATION 20AL05EB1807    LAT. 53D 33M  8S  LONG. 113D 22M 52S   PR 3   UTM 12 342250E 5936100N  FOR JUN 15, 1981 TO AUG 17, 1983
TEXACO CANADA LTD EDMONTON                       DAF EFFLUENT GRAB
NW S31 T52 R23 W4M

                       07105L        07205L        07562L        07021L        07906L        07905L        15421L        97160S
                      NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN     PHOSPHORUS    DISCHARGE
                      DISSOLVED     DISSOLVED     DISSOLVED       TOTAL      PARTICULATE   PARTICULATE     TOTAL         INSTANT
                      NO3 & NO2      NITRITE       AMMONIA      KJELDAHL        TOTAL        (CALCD.)
               SUBM       N             N             N             N             N             N             P
                 ID     MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L            M3/S
SAMPLES(FLAGS)          17(9)         17(14)        17(0)         17(0)         12(0)                       17(0)
           LOW           .017         L.02           .052          .525          .01                         .065
          HIGH           .52           .45         16.400        16.750         2.10                         .525
       AVERAGE           .077*         .065*        2.481         3.807          .525                        .182
      STD.DEV.           .117*         .100*        3.797         3.660          .532                        .127
   PERCNT:10TH           .025         L.02           .45          1.15           .19                         .08
          25TH           .04           .02           .830         1.750          .285                        .10
   MEDIAN 50TH          L.05          L.05          1.710         3.600          .400                        .140
          75TH          L.05          L.05          2.100         4.000          .550                        .203
          90TH           .15           .05          5.440         6.200          .76                         .440
SECONDARY CODE                                   61L           15L                                        19L

                       10474L        10407L        10511L        10453L        14101L        97160S        97163S
                       RESIDUE       RESIDUE       RESIDUE       RESIDUE       SILICA       DISCHARGE     DISCHARGE
                        TOTAL     NONFILTRABLE    VOLATILE     FILTRABLE     REACTIVE       INSTANT         DAILY
                                                  NONFILTR.                                                  MEAN
               SUBM                               (CALCD.)                    SIO2
                 ID    MG/L          MG/L          MG/L          MG/L          MG/L          M3/S          CFS
SAMPLES(FLAGS)          17(0)         17(0)                       12(0)         17(0)                       16(0)
           LOW          422.           10.                        410.           2.6                         .58
          HIGH         1914.           83.0                      1470.           7.8                        1.40
       AVERAGE          922.0          28.7                       799.2          5.47                       1.0700
      STD.DEV.          390.0          23.9                       279.5          1.25                        .2647
   PERCNT:10TH          607.           10.                        590.           4.0                         .73
          25TH          672.           13.                        615.0          4.7                         .7950
   MEDIAN 50TH          830.           18.                        765.0          5.3                        1.1400
          75TH          970.           30.                        885.0          6.4                        1.3200
          90TH         1531.           81.                       1110.           7.0                        1.34
SECONDARY CODE         71L           01L                                      02L

                       00205L        02074L        06537L        06524L        02001L        16101L        10701L        06608L
                       TOTAL        TURBIDITY      PHENOLIC     OIL AND         ODOUR        SULPHIDE      SURFACT.        CYANIDE
                      DISSOLVED                    MATERIAL     GREASE       THRESHOLD     DISSOLVED      N-ALKYL
                       SOLIDS                                                  NUMBER                     SULPHNTS.
               SUBM                                PHENOL                                       S            LAS           CN
                 ID     MG/L          NTU          MG/L          MG/L           TON          MG/L          MG/L          MG/L
SAMPLES(FLAGS)          17(0)         16(0)        17(0)         17(1)         13(0)         15(4)          7(0)          4(1)
           LOW          304.            1.9         .035           .5            1.           .02           .40         L.002
          HIGH         1938.           38.0         .970         27.3          100.           .56          5.55          .075
       AVERAGE          774.9           6.2         .206          4.847*        27.           .135*        1.644         .0310*
      STD.DEV.          388.8           8.6         .214          6.198*        42.           .142*        1.885         .0335*
   PERCNT:10TH          472.            1.9         .040         L1.0            1.          L.05
          25TH          558.            3.0         .13           2.4            2.          L.05           .46          .0050*
   MEDIAN 50TH          683.            3.8         .175          2.9            4.           .09           .48          .0235
          75TH          827.            5.3         .205          4.6           10.           .18          2.10          .0570
          90TH         1475.            8.0         .321         10.3          100.           .32
SECONDARY CODE                                                 21L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  43                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                  INDUSTRIAL MONITORING
STATION 20AL05EB1807    LAT. 53D 33M  8S  LONG. 113D 22M 52S   PR 3   UTM 12 342250E 5936100N  FOR JUN 15, 1981 TO AUG 17, 1983
TEXACO CANADA LTD EDMONTON              DAF EFFLUENT GRAB
NW S31 T52 R23 W4M

                      08304L        08202L        06107L        06154L        06001L        06051L        06006L        06905L
                      OXYGEN        OXYGEN        CARBON        CARBON        CARBON        CARBON        CARBON        CARBON
                      TOTAL         BIOCHEM.      DISSOLVED     DISSOLVED     TOTAL         TOTAL         TOTAL         PARTICULATE
                      COD           DEMAND-BOD    ORGANIC       INORGANIC     ORGANIC       INORGANIC                   TOTAL
               SUBM   02            02            C             C             C             C             C             C
                ID    MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)        17(0)         6(1)          12(0)         12(0)         5(0)                                      12(0)
           LOW        21.0          L1.0          4.1           25.           10.8                                      2.13
          HIGH        232.          61.2          31.           39.           52.2                                      47.00
       AVERAGE        78.4          28.78*        16.26         32.46         26.12                                     8.91
      STD.DEV.        49.6          24.74*        7.04          5.31          16.37                                     12.65
   PERCNT:10TH        31.                         10.0          26.5                                                    2.16
          25TH        51.1          6.2           11.00         27.50         15.1                                      2.58
   MEDIAN 50TH        63.8          25.10         16.00         32.50         22.0                                      4.00
          75TH        92.7          54.1          19.00         37.50         30.5                                      10.16
          90TH        139.                        24.           38.                                                     13.61
SECONDARY CODE        01L                                                     07L

                      24101L        24009L        24302L        80015L        80011L        27009L        27302L        47304L
                      CHROMIUM      CHROMIUM      CHROMIUM      MERCURY       MERCURY       COBALT        COBALT        SILVER
                      HEXAVALENT    TOTAL         EXTRBLE.      TOTAL         TOTAL         TOTAL         EXTRBLE.      EXTRBLE.

               SUBM   CR            CR            CR            HG            HG            CO            CO            AG
                ID    MG/L          MG/L          MG/L          MG/L          UG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)        16(13)        17(0)                       17(10)                      17(13)                      5(5)
           LOW        L.001         .015                        L.0001                      L.001                       L.02
          HIGH        .02           .204                        .0010                       L.01                        L.02
       AVERAGE        .005*         .064                        .0002*                      .004*
      STD.DEV.        .006*         .053                        .0002*                      .004*
   PERCNT:10TH        L.001         .02                         L.0001                      L.001
          25TH        L.001         .03                         L.0001                      L.001                       L.02
   MEDIAN 50TH        L.001         .04                         L.0001                      .001                        L.02
          75TH        L.010         .068                        .0002                       L.01                        L.02
          90TH        L.01          .166                        .0006                       L.01
SECONDARY CODE

                      29009L        29305L        28009L        28302L        48009L        48302L        82009L        82302L
                      COPPER        COPPER        NICKEL        NICKEL        CADMIUM       CADMIUM       LEAD          LEAD
                      TOTAL         EXTRBLE.      TOTAL         EXTRBLE.      TOTAL         EXTRBLE.      TOTAL         EXTRBLE.

               SUBM   CU            CU            NI            NI            CD            CD            PB            PB
                ID    MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)        16(4)                       17(5)                       17(15)                      8(3)          9(3)
           LOW        L.001                       .005                        L.001                       L.003         .006
          HIGH        .015                        .023                        L.01                        .012          .06
       AVERAGE        .007*                       .012*                       .004*                       .006*         .021*
      STD.DEV.        .004*                       .007*                       .004*                       .003*         .018*
   PERCNT:10TH        L.001                       .006                        L.001
          25TH        L.005                       .006                        L.001                       L.003         .008
   MEDIAN 50TH        .007                        .008                        L.001                       .005          L.02
          75TH        .009                        L.02                        L.01                        .009          L.02
          90TH        .015                        L.02                        L.01
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0010 -  0012 PAGE  44                     NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB1807    LAT. 53D 33M  8S  LONG. 113D 22M 52S   PR 3   UTM 12 342250E 5936100N  FOR JUN 15, 1981 TO AUG 17, 1983
TEXACO CANADA LTD EDMONTON                DAF EFFLUENT GRAB
NW S31 T52 R23 W4M
                       30009L        30365L        25003L        25304L        23009L        42304L        42009L        51003L
                        ZINC          ZINC        MANGANESE     MANGANESE     VANADIUM     MOLYBDENUM    MOLYBDENUM     ANTIMCNY
                       TOTAL        EXTRBLE.       TOTAL        EXTRBLE.       TOTAL        EXTRBLE.       TOTAL         TOTAL

                 SUBM   ZN            ZN            MN            MN            V             MO            MO            SB
                  ID   MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)         17(1)                       17(0)                       12(6)                       12(7)          5(1)
           LOW          L.001                        .026                       L.002                       L.001        L.001
          HIGH           .311                        .180                        .01                         .023         .0071
       AVERAGE           .060*                       .071                        .007*                       .013*        .0033*
      STD.DEV.           .077*                       .045                        .003*                       .009*        .0023*
   PERCNT:10TH           .008                        .028                       L.002                       L.001
          25TH           .02                         .035                        .005                        .004         .0024
   MEDIAN 50TH           .028                        .062                        .007                        .016*        .003
          75TH           .051                        .103                       L.010                       L.020         .003
          90TH           .14                         .131                       L.01                        L.02
SECONDARY CODE

                       33005L        33104L        34005L        34102L        13111L        13306L        04102L        04304L
                       ARSENIC       ARSENIC      SELENIUM      SELENIUM      ALUMINUM      ALUMINUM     BERYLLIUM     BERYLLIUM
                      TOTAL        DISSOLVED     TOTAL         DISSOLVED     DISSOLVED     EXTRBLE.     DISSOLVED      EXTRBLE.

                 SUBM   AS            AS            SE            SE            AL            AL            BE            BE
                  ID   MG/L          MG/L          MG/L          MG/L          UG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)          7(1)                        7(2)                        5(0)          7(0)          5(4)          7(6)
           LOW        L.001                       L.0002                      1300.           .900        L.005         L.001
          HIGH         .006                         .009                      3000.          7.990         .005          .001
       AVERAGE         .0028*                       .0031*                    1660.00        2.220         .005*         .001*
      STD.DEV.         .0017*                       .0032*                     749.63        2.552         .000*         .000*
   PERCNT:10TH
          25TH         .0016                      L.0002                      1300.          1.180        L.005         L.001
   MEDIAN 50TH         .002                         .002                      1330.          1.330        L.005         L.001
          75TH         .004                         .005                      1370.          1.530        L.005         L.001
          90TH
SECONDARY CODE                                    07L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  45                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB1808    LAT. 53D 33M  8S  LONG. 113D 22M 52S   PR 3   UTM 12 342250E 5936100N  FOR JUN 16, 1981 TO AUG 16, 1983
TEXACO CANADA LTD EDMONTON                   DAF EFFLUENT COMP.
NW S31 T52 R23 W4M

                         02061F      10301L      10301F      10151L      10101L      02041L      97160S      97163S
                       TEMPERATURE     PH          PH      ALKALINITY  ALKALINITY   SPECIFIC   DISCHARGE   DISCHARGE
                        OF WATER                             PHENOL       TOTAL     CONDUCT.    INSTANT      DAILY
                                                           PHTHALEIN                                          MEAN
                   SUBM                                      CACO3       CACO3
                    ID  DEG.C       PH UNITS    PH UNITS     MG/L        MG/L        US/CM       M3/S         CFS
SAMPLES(FLAGS)           1(0)        7(0)        2(0)        7(0)        7(0)        7(0)                    7(0)
           LOW           25.5        7.1         7.4          .0         74.         1002.                    .76
          HIGH           25.5        8.3         7.8         7.5        119.         2790.                   1.40
       AVERAGE                                               1.1          97.7       1343.                   1.0943
      STD.DEV.                                               2.8          16.1        642.                    .2704
  PERCNT:10TH
          25TH                       7.2                      .0         83.         1080.                    .82
  MEDIAN  50TH                       7.4         7.60         .0         94.         1097.                   1.12
          75TH                       7.6                      .0        111.         1223.                   1.34
          90TH
SECONDARY CODE

                         06201L      06202L      06301L      20103L      20105L      10602L      10604L      97160S
                       BICARBONT.  BICARBONT.  CARBONATE    CALCIUM     CALCIUM    HARDNESS    HARDNESS   DISCHARGE
                         (CALCD.)    (CALCD.)    (CALCD.)   DISSOLVED   DISSOLVED     TOTAL       TOTAL      INSTANT
                                                                         (CALCD.)   (CALCD.)
                   SUBM  HCO3        HCO3        CO3          CA          CA         CACO3       CACO3
                    ID  MG/L         MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        M3/S
SAMPLES(FLAGS)           7(0)        1(0)        7(0)        7(0)        3(0)        2(0)        5(0)
           LOW           90.         132.         0.         58.          57.9       264.6       223.
          HIGH          145.         132.         9.        119.          60.6       339.1       417.
       AVERAGE          117.                      1.          79.7        59.1       301.9       297.8
      STD.DEV.           22.                      3.          23.5         1.4        52.7        97.0
  PERCNT:10TH
          25TH           96.                      0.         59.                                 225.
  MEDIAN  50TH          115.                      0.         73.          58.7       301.9       234.
          75TH          135.                      0.        100.                                 390.
          90TH
SECONDARY CODE                                           11L 10L

                         11103L      12102L      19103L      09107L      17203L      16306L      26009L      26304L
                         SODIUM    MAGNESIUM   POTASSIUM    FLUORIDE    CHLORIDE    SULPHATE      IRON        IRON
                       DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED     TOTAL      EXTRBLE.

                   SUBM   NA          MG          K           F           CL          SO4         FE          FE
                    ID   MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           7(0)        7(0)        7(0)        7(0)        7(0)        7(0)        2(0)        5(1)
           LOW           89.         19.         2.9          .18        121.         140.         .18        L.02
          HIGH          451.         41.         6.9          .34        790.         305.         .31         .19
       AVERAGE          152.9        24.4        4.13         .274       237.57       215.9        .245        .108*
      STD.DEV.          132.2         8.1        1.63         .051       247.41        59.0        .092        .068*
  PERCNT:10TH
          25TH           89.         19.         2.9          .26        125.         160.                     .08
  MEDIAN  50TH          113.         20.         3.1          .28        128.         240.         .245        .09
          75TH          124.         29.         5.7          .32        242.         251.                     .16
          90TH
SECONDARY CODE          11L         11L         11L         06L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  46                       NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                        INDUSTRIAL MONITORING
STATION 20AL05EB1808    LAT. 53D 33M  8S  LONG. 113D 22M 52S   PR 3   UTM 12 342250E 5936100N  FOR JUN 16, 1981 TO AUG 16, 1983
TEXACO CANADA LTD EDMONTON              DAF EFFLUENT COMP.
NW S31 T52 R23 W4M

                        07105L        07205L        07562L        07021L        07906L        07905L        15421L        97160S
                       NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN     PHOSPHORUS    DISCHARGE
                       DISSOLVED     DISSOLVED     DISSOLVED      TOTAL       PARTICULATE   PARTICULATE     TOTAL        INSTANT
                       NO3 & NO2     NITRITE       AMMONIA       KJELDAHL       TOTAL        (CALCD.)
                SUBM       N             N             N             N             N             N             P
                 ID       MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          M3/S
SAMPLES(FLAGS)            7(5)          7(7)          7(0)          7(0)          5(0)                        7(0)
           LOW            .025          L.02           .57           1.0           .28                         .05
          HIGH            L.05          L.05         2.000         5.000           .7                          .250
       AVERAGE            .045*                      1.156         2.696           .528                        .133
      STD.DEV.            .010*                       .589         1.607           .186                        .074
   PERCNT:10TH
          25TH            .04           L.02          .690          1.00           .4                          .065
   MEDIAN 50TH            L.05          L.05          .829         2.275           .56                         .120
          75TH            L.05          L.05         1.700         4.200           .7                          .189
          90TH
SECONDARY CODE                                      61L           15L                                       19L

                        10474L        10407L        10511L        10453L        14101L        97160S        97163S
                        RESIDUE       RESIDUE       RESIDUE       RESIDUE       SILICA       DISCHARGE     DISCHARGE
                         TOTAL      NONFILTRABLE    VOLATILE     FILTRABLE     REACTIVE       INSTANT        DAILY
                                                   NONFILTR.                                                 MEAN
                SUBM                               (CALCD.)                     SIO2
                 ID       MG/L          MG/L          MG/L          MG/L          MG/L          M3/S          CFS
SAMPLES(FLAGS)            7(0)          7(0)                        5(0)          7(0)                        7(0)
           LOW            566.           12.                        550.           4.4                         .76
          HIGH           1782.           17.                       1000.           6.9                        1.40
       AVERAGE            913.3          15.1                       754.0          5.36                       1.0943
      STD.DEV.            419.3           1.9                       210.4           .91                        .2704
   PERCNT:10TH
          25TH            617.           14.0                       600.           4.5                         .82
   MEDIAN 50TH            766.           16.                        660.           5.3                        1.12
          75TH           1014.           17.0                       960.           5.9                        1.34
          90TH
SECONDARY CODE          71L           01L                                         02L

                        00205L        02074L        06537L        06524L        02001L        16101L        10701L        06608L
                         TOTAL       TURBIDITY     PHENOLIC       OIL AND        ODOUR        SULPHIDE      SURFACT.       CYANIDE
                       DISSOLVED                   MATERIAL       GREASE       THRESHOLD     DISSOLVED      N-ALKYL
                        SOLIDS                                                   NUMBER                     SULPHNTS.
                SUBM                                PHENOL                                         S           LAS           CN
                 ID       MG/L          NTU          MG/L          MG/L           TON           MG/L          MG/L          MG/L
SAMPLES(FLAGS)            7(0)          7(0)          7(0)          7(0)          7(0)          1(0)          2(0)
           LOW            512.           1.4          .100           .3            1.           .04           .37
          HIGH           1742.           5.6          .190           4.5          100.          .04          1.75
       AVERAGE            779.3          4.2          .134          3.214          17.                       1.060
      STD.DEV.            438.1          1.4          .040          1.426          37.                        .976
   PERCNT:10TH
          25TH            523.           3.8          .100           2.8           1.
   MEDIAN 50TH            631.           4.5          .110           3.5           2.                        1.060
          75TH            788.           5.0          .185           4.5          10.
          90TH
SECONDARY CODE                                                    21L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  47                     NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB1808    LAT. 53D 33M  8S  LONG. 113D 22M 52S   PR 3   UTM 12 342250E 5936100N  FOR JUN 16, 1981 TO AUG 16, 1983
TEXACO CANADA LTD EDMONTON                DAF EFFLUENT COMP.
NW S31 T52 R23 W4M

                     08304L      08202L      06107L      06154L      06001L      06051L      06006L      06905L
                     OXYGEN      OXYGEN      CARBON      CARBON      CARBON      CARBON      CARBON      CARBON
                      TOTAL     BIOCHEM.    DISSOLVED   DISSOLVED    TOTAL       TOTAL      TOTAL      PARTICULATE
                       COD     DEMAND-BOD    ORGANIC    INORGANIC    ORGANIC    INORGANIC                TOTAL
                SUBM   02          02          C           C           C           C           C           C
                 ID  MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)        7(0)        3(0)        5(0)        5(0)        2(0)                                5(0)
           LOW        32.         30.1        9.          23.         15.4                                 1.94
          HIGH        205.        33.8        21.         38.         17.1                                 7.
       AVERAGE        88.2        31.70       14.44       31.60       16.25                                4.74
      STD.DEV.        57.6         1.90        5.32        6.43        1.20                                2.16
  PERCNT:10TH
          25TH        40.1                     9.2        29.0                                             3.
   MEDIAN 50TH        76.0        31.2        15.         30.         16.25                                5.77
          75TH        105.1                   18.         38.                                              6.
          90TH
SECONDARY CODE       01L                                             07L

                     24101L      24009L      24302L      80015L      80011L      27009L      27302L      47304L
                    CHROMIUM    CHROMIUM    CHROMIUM    MERCURY     MERCURY     COBALT      COBALT      SILVER
                   HEXAVALENT    TOTAL       EXTRBLE.    TOTAL       TOTAL       TOTAL      EXTRBLE.    EXTRBLE.

                SUBM   CR          CR          CR          HG          HG          CO          CO          AG
                 ID  MG/L        MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)        7(7)        7(0)                    6(5)        1(1)        7(5)                    2(2)
           LOW        L.001        .02                    .0001       L.02        L.001                   L.02
          HIGH        L.01         .111                   L.0001      L.02        L.01                    L.02
       AVERAGE                     .051                   .0001*                   .004*
      STD.DEV.                     .032                   .0000*                   .004*
  PERCNT:10TH
          25TH        L.001        .024                   L.0001                  L.001
   MEDIAN 50TH        L.001        .037                   L.0001                   .003                   L.020
          75TH        L.01         .07                    L.0001                  L.01
          90TH
SECONDARY CODE

                     29009L      29305L      28009L      28302L      48009L      48302L      82009L      82302L
                     COPPER      COPPER      NICKEL      NICKEL      CADMIUM     CADMIUM     LEAD        LEAD
                      TOTAL      EXTRBLE.    TOTAL       EXTRBLE.    TOTAL       EXTRBLE.    TOTAL      EXTRBLE.

                SUBM   CU          CU          NI          NI          CD          CD          PB          PB
                 ID  MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)        7(1)                    7(2)                    7(5)                    4(2)        3(2)
           LOW        L.005                    .007                   L.001                   L.003       L.02
          HIGH         .037                   L.02                    L.01                     .005        .020
       AVERAGE         .017*                   .012*                   .004*                   .004*       .020*
      STD.DEV.         .013*                   .006*                   .004*                   .001*       .000*
  PERCNT:10TH
          25TH         .006                    .007                   L.001                   L.003
   MEDIAN 50TH         .009                    .009                    .002                    .003*      L.02
          75TH         .032                   L.02                    L.01                     .005
          90TH
SECONDARY CODE
```

```
REQUEST 0010 -  0012 PAGE  48                           NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                          INDUSTRIAL MONITORING
STATION 20AL05EB1808    LAT. 53D 33M  8S  LONG. 113D 22M 52S   PR 3   UTM 12 342250E 5936100N  FOR JUN 16, 1981 TO AUG 16, 1983
TEXACO CANADA LTD EDMONTON                   DAF EFFLUENT COMP.
NW S31 T52 R23 W4M

                          30009L      30305L      25003L      25304L      23009L      42304L      42009L      51003L
                           ZINC        ZINC      MANGANESE   MANGANESE   VANADIUM   MOLYBDENUM  MOLYBDENUM   ANTIMONY
                           TOTAL     EXTRBLE.      TOTAL     EXTRBLE.      TOTAL     EXTRBLE.      TOTAL       TOTAL

                   SUBM     ZN          ZN          MN          MN          V           MO          MO          SB
                    ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)             7(0)                    7(0)                    4(3)                    4(3)        2(0)
           LOW             .082                    .030                    L.002                   L.001       .001
          HIGH             .217                    .123                    L.01                    L.02        .005
       AVERAGE             .132                    .061                     .007*                   .012*      .0030
      STD.DEV.             .054                    .042                     .004*                   .009*      .0028
   PERCNT:10TH
          25TH             .086                    .035                     .004*                   .005*
   MEDIAN 50TH             .12                     .040                     .008*                   .014*      .0030
          75TH             .192                    .121                    L.010                   L.020
          90TH
SECONDARY CODE

                          33005L      33104L      34005L      34102L      13111L      13306L      04102L      04304L
                          ARSENIC     ARSENIC    SELENIUM    SELENIUM    ALUMINUM    ALUMINUM    BERYLLIUM   BERYLLIUM
                          TOTAL      DISSOLVED   TOTAL       DISSOLVED   DISSOLVED   EXTRBLE.    DISSOLVED    EXTRBLE.

                   SUBM     AS          AS          SE          SE          AL          AL          BE          BE
                    ID     MG/L        MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)             2(0)                    2(0)                     2(0)       2(0)         2(2)        2(2)
           LOW             .003                    .001                    1210.       1.050        L.005       L.001
          HIGH             .008                    .003                    1360.       1.340        L.005       L.001
       AVERAGE             .0055                   .0020                   1285.00     1.195
      STD.DEV.             .0035                   .0014                    106.07      .205
   PERCNT:10TH
          25TH
   MEDIAN 50TH             .0055                   .0020                   1285.00     1.195        L.005       L.001
          75TH
          90TH
SECONDARY CODE                                     07L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  49                          NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                          INDUSTRIAL MONITORING
STATION 20AL05EB2000    LAT. 53D 33M 48S  LONG. 113D 22M 33S   PR 3   UTM 12 342650E 5937350N  FOR APR 29, 1980 TO AUG 09, 1984
GULF OIL CANADA LTD EDMONTON               FINAL EFFLUENT GRAB
S5 T53 R23 W4M

                            02061F      10301L      10301F      10151L      10101L      02041L      97160S      97163S
                         TEMPERATURE      PH          PH      ALKALINITY  ALKALINITY   SPECIFIC   DISCHARGE   DISCHARGE
                          OF WATER                              PHENOL      TOTAL      CONDUCT.    INSTANT      DAILY
                                                              PHTHALEIN                                         MEAN
                   SUBM                                         CACO3       CACO3
                    ID     DEG.C      PH UNITS    PH UNITS      MG/L        MG/L        US/CM       M3/S         CFS
SAMPLES(FLAGS)             17(0)       18(0)        3(0)        17(1)       18(0)       18(0)                   19(0)
           LOW               4.0         6.9         8.0           .0         96.        742.                    .085
          HIGH              25.0         8.1         8.6          L.5        175.       2650.                   1.72
       AVERAGE              14.9                                  .0*        138.8      1870.                    .5658
      STD.DEV.               7.0                                  .1*         18.3       464.                    .3743
  PERCNT:10TH                6.0         7.2                      .0         122.       1057.                    .085
          25TH              10.          7.3                      .0         127.       1710.                    .35
   MEDIAN 50TH              16.0         7.40        8.5          .0         137.5      1805.                    .46
          75TH              21.0         7.7                      .0         146.6      2220.                    .68
          90TH              24.0         7.90                     .0         163.0      2420.                   1.19
SECONDARY CODE

                            06201L      06202L      06301L      20103L      20105L      10602L      10604L      97160S
                          BICARBONT.  BICARBONT.  CARBONATE    CALCIUM     CALCIUM    HARDNESS    HARDNESS   DISCHARGE
                           (CALCD.)    (CALCD.)    (CALCD.)   DISSOLVED   DISSOLVED     TOTAL       TOTAL      INSTANT
                                                                          (CALCD.)    (CALCD.)
                   SUBM     HCO3        HCO3         CO3          CA          CA        CACO3       CACO3
                    ID     MG/L         MG/L        MG/L         MG/L        MG/L        MG/L        MG/L        M3/S
SAMPLES(FLAGS)             17(1)        5(0)       17(1)        17(0)        5(0)       13(0)        6(0)
           LOW              117.        151.          0.          45.       103.9       170.0       367.
          HIGH              213.        190.         Q1.        166.0       136.8       618.3       572.0
       AVERAGE              168.*       172.          0.*       122.3       121.7       419.2       479.7
      STD.DEV.               22.*        15.          0.*        32.0        11.8       120.0        74.6
  PERCNT:10TH               149.                      0.          85.                   323.4
          25TH              155.        165.          0.         107.       120.6       339.3       447.0
   MEDIAN 50TH              165.        173.          0.         123.0      122.7       423.2       471.5
          75TH              176.        179.          0.         149.0      124.7       489.7       549.0
          90TH              199.                      0.         158.0                  558.3
SECONDARY CODE                                            11L 10L

                            11103L      12102L      19103L      09107L      17203L      16306L      26009L      26304L
                            SODIUM     MAGNESIUM   POTASSIUM   FLUORIDE    CHLORIDE    SULPHATE      IRON        IRON
                          DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED     TOTAL      EXTRBLE.

                   SUBM      NA          MG           K           F           CL         S04          FE          FE
                    ID      MG/L        MG/L        MG/L        MG/L         MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)             18(0)       18(0)       18(0)       18(0)        18(0)       18(0)        2(0)       16(0)
           LOW               29.         14.          2.7       1.030        15.          80.          .74         .06
          HIGH              340.0        49.5        24.0      29.00        522.0       455.0        1.22        5.41
       AVERAGE              205.5        32.8         7.63      6.714       310.11      301.1         .980       1.346
      STD.DEV.               71.7         9.1         5.97      7.014       122.59       92.2         .339       1.585
  PERCNT:10TH                72.         24.          3.7       1.810        72.        215.                     .18
          25TH              197.         26.          4.40      2.10        270.        230.                     .220
   MEDIAN 50TH              215.0        32.0         5.40      3.350       317.50      294.5         .980        .485
          75TH              221.         41.          7.6       9.75        380.        350.                    2.295
          90TH              295.         43.         22.0      15.75        446.0       449.0                   3.64
SECONDARY CODE              11L          11L         11L        06L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  50
                                                  NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                     INDUSTRIAL MONITORING
STATION 20AL05EB2000    LAT. 53D 33M 48S  LONG. 113D 22M 33S   PR 3   UTM 12 342650E 5937350N  FOR APR 29, 1980 TO AUG 09, 1984
GULF OIL CANADA LTD EDMONTON             FINAL EFFLUENT GRAB
S5 T53 R23 W4M

                       07105L       07205L       07562L       07021L       07906L       07905L       15421L       97160S
                      NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN    PHOSPHORUS   DISCHARGE
                      DISSOLVED    DISSOLVED    DISSOLVED     TOTAL     PARTICULATE  PARTICULATE    TOTAL       INSTANT
                      NO3 & NO2     NITRITE     AMMONIA     KJELDAHL      TOTAL       (CALCD.)
                 SUBM     N            N            N            N            N            N            P
                  ID    MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L        M3/S
SAMPLES(FLAGS)         18(13)       18(15)       18(0)        17(0)        13(0)                     17(0)
           LOW         L.02         L.02          .013        1.650         .25                       .108
          HIGH          .370         .25         2.300       11.000        1.10                      1.15
       AVERAGE          .097*        .069*        .721        3.179         .623                      .370
      STD.DEV.          .100*        .060*        .720        2.277         .260                      .341
  PERCNT:10TH          L.02         L.02          .039        1.800         .31                       .130
          25TH         L.05         L.05          .180        2.040         .47                       .150
   MEDIAN 50TH         L.050        L.050         .400        2.250         .660                      .200
          75TH          .10         L.050        1.130        3.350         .7                        .360
          90TH          .27          .20         1.940        6.000        1.07                      1.010
SECONDARY CODE                                 61L          15L                                   19L 06L

                       10474L       10407L       10511L       10453L       14101L       97160S       97163S
                       RESIDUE      RESIDUE      RESIDUE      RESIDUE      SILICA      DISCHARGE    DISCHARGE
                        TOTAL    NONFILTRABLE    VOLATILE   FILTRABLE    REACTIVE      INSTANT       DAILY
                                                NONFILTR.                                            MEAN
                 SUBM                           (CALCD.)                   SIO2
                  ID    MG/L         MG/L         MG/L         MG/L         MG/L         M3/S         CFS
SAMPLES(FLAGS)         16(0)        18(0)         1(0)        14(0)        18(0)                     19(0)
           LOW          560.          11.          10.0         540.          2.0                      .085
          HIGH         2027.         557.          10.0        1930.         14.2                     1.72
       AVERAGE         1367.0         68.7                     1217.1         9.65                      .5658
      STD.DEV.          390.2        126.2                      312.5         3.55                      .3743
  PERCNT:10TH          1052.          17.                      1030.          3.5                       .085
          25TH         1137.5         20.6                     1100.          6.7                       .35
   MEDIAN 50TH         1251.0         25.5                     1150.0        10.00                      .46
          75TH         1665.5         52.                      1380.         12.1                       .68
          90TH         1955.         140.                      1550.         14.0                      1.19
SECONDARY CODE         71L          01L                       51L          02L

                       00205L       02074L       06537L       06524L       02001L       16101L       10701L       06608L
                        TOTAL      TURBIDITY    PHENOLIC     OIL AND       ODOUR      SULPHIDE     SURFACT.     CYANIDE
                      DISSOLVED                 MATERIAL     GREASE     THRESHOLD    DISSOLVED    N-ALKYL
                       SOLIDS                                             NUMBER                  SULPHNTS.
                 SUBM                           PHENOL                                   S           LAS          CN
                  ID    MG/L         NTU          MG/L         MG/L          TON         MG/L         MG/L         MG/L
SAMPLES(FLAGS)         17(0)        15(0)        18(0)        17(0)        14(0)        14(4)         9(0)         7(2)
           LOW          367.          6.0          .010          .7            1.       L.02          .26         L.002
          HIGH         1798.0        127.          .290        28.6          1000.         .37         4.75          .510
       AVERAGE         1061.3         32.4         .093         5.482         103.         .144*       2.040         .0914*
      STD.DEV.          330.2         32.4         .075         6.681         262.         .108*       1.779         .1882*
  PERCNT:10TH           595.          7.4          .013         1.0            1.       L.02
          25TH          913.         11.0          .029         2.2            1.       L.020          .44         L.002
   MEDIAN 50TH         1038.         21.0          .092         3.2           10.         .145        2.40          .007
          75TH         1231.         40.0          .105         5.6          100.          .22         2.88          .103
          90TH         1525.0        70.0          .200        12.8          100.          .26
SECONDARY CODE                      73L                       21L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  51                  NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                 INDUSTRIAL MONITORING
STATION 20AL05EB2000    LAT. 53D 33M 48S  LONG. 113D 22M 33S   PR 3   UTM 12 342650E 5937350N  FOR APR 29, 1980 TO AUG 09, 1984
GULF OIL CANADA LTD EDMONTON               FINAL EFFLUENT GRAB
S5 T53 R23 W4M

                        08304L      08202L      06107L      06154L      06001L      06051L      06006L      06905L
                        OXYGEN      OXYGEN      CARBON      CARBON      CARBON      CARBON      CARBON      CARBON
                         TOTAL     BIOCHEM.    DISSOLVED   DISSOLVED     TOTAL       TOTAL     TOTAL       PARTICULATE
                          COD     DEMAND-BOD    ORGANIC    INORGANIC    ORGANIC    INORGANIC                 TOTAL
                 SUBM     02          02          C           C           C           C           C           C
                  ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           18(0)        4(0)       14(0)       13(0)        4(0)        2(0)        1(0)       13(0)
           LOW            29.0        30.0         5.3        24.         18.8        27.         95.          1.41
          HIGH           290.0        47.3        50.         47.0        68.         34.0        95.         17.71
       AVERAGE           103.0        40.82       15.64       34.72       46.95       30.50                    6.91
      STD.DEV.            72.2         8.18       13.28        6.17       20.60        4.95                    4.78
   PERCNT:10TH            34.3                     6.         27.0                                             1.95
          25TH            47.7        34.50        9.0        31.0        33.40                                3.92
    MEDIAN 50TH           74.5        43.00       11.50       34.0        50.50       30.50                    5.
          75TH           129.4        47.15       14.         36.70       60.50                                9.69
          90TH           223.0                    41.4        43.0                                            13.00
SECONDARY CODE           01L                     01L                     05L 07L     52L

                        24101L      24009L      24302L      80015L      80011L      27009L      27302L      47304L
                       CHROMIUM    CHROMIUM    CHROMIUM    MERCURY     MERCURY     COBALT      COBALT      SILVER
                      HEXAVALENT    TOTAL       EXTRBLE.    TOTAL       TOTAL       TOTAL       EXTRBLE.    EXTRBLE.

                 SUBM     CR          CR          CR          HG          HG          CO          CO          AG
                  ID     MG/L        MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           15(9)       17(0)                   17(14)       1(1)       17(4)        1(1)        2(2)
           LOW           L.001        .023                    .0000       L.02       L.001       L.001        L.02
          HIGH            .840       1.34                     .0006       L.02        .011       L.001        L.02
       AVERAGE            .071*       .671                    .0001*                  .005*
      STD.DEV.            .217*       .440                    .0001*                  .003*
   PERCNT:10TH           L.001        .199                   L.0001                  L.001
          25TH           L.001        .300                   L.0001                   .003
    MEDIAN 50TH          L.001        .622                   L.0001                   .004                    L.020
          75TH            .02        1.070                   L.0001                   .008
          90TH            .162       1.32                     .0001                  L.01
SECONDARY CODE

                        29009L      29305L      28009L      28302L      48009L      48302L      82009L      82302L
                        COPPER      COPPER      NICKEL      NICKEL      CADMIUM     CADMIUM      LEAD        LEAD
                         TOTAL      EXTRBLE.     TOTAL      EXTRBLE.     TOTAL      EXTRBLE.     TOTAL      EXTRBLE.

                 SUBM     CU          CU          NI          NI          CD          CD          PB          PB
                  ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           17(0)        1(0)       16(3)        1(0)       16(7)        1(1)        8(3)       10(5)
           LOW            .004        .003       L.001        .002       L.001       L.001       L.003       L.003
          HIGH            .081        .003        .090        .002       L.01        L.001        .012        .038
       AVERAGE            .020                    .020*                   .003*                   .007*       .012*
      STD.DEV.            .020                    .020*                   .003*                   .004*       .012*
   PERCNT:10TH            .006                    .008                   L.001                               L.003
          25TH            .008                    .012                   L.001                   L.003       L.003
    MEDIAN 50TH           .012                    .014                    .002                    .007        .005
          75TH            .024                    .020*                   .004                    .010       L.02
          90TH            .055                    .031                   L.01                                 .031
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0010 -  0012 PAGE  52                        NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                       INDUSTRIAL MONITORING
STATION 20AL05EB2000    LAT. 53D 33M 48S  LONG. 113D 22M 33S   PR 3   UTM 12 342650E 5937350N  FOR APR 29, 1980 TO AUG 09, 1984
GULF OIL CANADA LTD EDMONTON                FINAL EFFLUENT GRAB
S5 .53 R23 W4M

                          30009L      30305L      25003L      25304L      23009L      42304L      42009L      51003L
                           ZINC        ZINC     MANGANESE   MANGANESE    VANADIUM   MOLYBDENUM  MOLYBDENUM   ANTIMONY
                          TOTAL     EXTRBLE.      TOTAL      EXTRBLE.     TOTAL      EXTRBLE.     TOTAL       TOTAL

                   SUBM     ZN          ZN          MN          MN          V           MO          MO          SB
                    ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)             17(0)       1(0)        17(0)       1(0)        14(2)                   13(2)        2(2)
           LOW              .040        .170        .089        .100        .003                    .005       L.001
          HIGH              .685        .170        .501        .100        .040                    .020       L.001
       AVERAGE              .310                    .192                    .011*                   .010*
      STD.DEV.              .207                    .129                    .010*                   .006*
  PERCNT:10TH               .098                    .095                    .004                    .005
          25TH              .156                    .118                    .007                    .006
   MEDIAN 50TH              .218                    .124                    .008                    .007      L.0010
          75TH              .48                     .205                   L.01                     .013
          90TH              .649                    .433                    .022                   L.02
SECONDARY CODE                                                             02L

                          33005L      33104L      34005L      34102L      13111L      13306L      04102L      04304L
                          ARSENIC     ARSENIC    SELENIUM    SELENIUM    ALUMINUM    ALUMINUM   BERYLLIUM   BERYLLIUM
                          TOTAL      DISSOLVED   TOTAL       DISSOLVED   DISSOLVED   EXTRBLE.   DISSOLVED    EXTRBLE.

                   SUBM     AS          AS          SE          SE          AL          AL          BE          BE
                    ID     MG/L        MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)             8(0)        1(0)        8(5)        1(0)         2(0)       12(0)        2(2)       12(12)
           LOW             .0037       .0026      L.0002       .0004       620.          .095      L.005       L.001
          HIGH             .0171       .0026       .008        .0004       710.        12.690      L.005       L.001
       AVERAGE             .0073                   .0014*                  665.00       1.825
      STD.DEV.             .0046                   .0027*                   63.64       3.739
  PERCNT:10TH                                                                            .120                  L.001
          25TH             .0040                  L.0002                                 .188                  L.001
   MEDIAN 50TH             .0059                  L.0002                   665.00        .408      L.005       L.001
          75TH             .0090                   .0012                                 .718                  L.001
          90TH                                                                          5.550                  L.001
SECONDARY CODE                                 07L                                     02L                     02L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  53                        NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                        INDUSTRIAL MONITORING
STATION 20AL05EB2001    LAT. 53D 33M 48S  LONG. 113D 22M 33S   PR 3   UTM 12 342650E 5937350N  FOR MAR 25, 1981 TO AUG 08, 1984
GULF OIL CANADA LTD EDMONTON               FINAL EFFLUENT COMP.
S5 T53 R23 W4M

                         02061F       10301L       10301F       10151L       10101L       02041L       97160S       97163S
                       TEMPERATURE      PH           PH       ALKALINITY   ALKALINITY    SPECIFIC    DISCHARGE    DISCHARGE
                        OF WATER                                PHENOL        TOTAL      CONDUCT.     INSTANT       DAILY
                                                              PHTHALEIN                                               MEAN
                 SUBM                                           CACO3        CACO3
                  ID     DEG.C       PH UNITS     PH UNITS      MG/L         MG/L        US/CM         M3/S          CFS
SAMPLES(FLAGS)                         5(0)         2(0)        4(0)         5(0)         5(0)                      5(0)
           LOW                         7.3          8.1           .0         122.        1770.                      .2725
          HIGH                         7.90         8.2           .0         168.0       2540.                     1.26
       AVERAGE                                                    .0         145.0       2038.                      .5745
      STD.DEV.                                                    .0          17.6        319.                      .3963
   PERCNT:10TH
          25TH                         7.4                        .0         134.        1816.                      .35
   MEDIAN 50TH                         7.6          8.15          .0         150.        1902.                      .45
          75TH                         7.8                        .0         151.2       2160.                      .54
          90TH
SECONDARY CODE

                         06201L       06202L       06301L       20103L       20105L       10602L       10604L       97160S
                       BICARBONT.   BICARBONT.   CARBONATE     CALCIUM      CALCIUM     HARDNESS     HARDNESS    DISCHARGE
                        (CALCD.)     (CALCD.)     (CALCD.)    DISSOLVED    DISSOLVED      TOTAL        TOTAL       INSTANT
                                                                           (CALCD.)     (CALCD.)
                 SUBM    HCO3         HCO3         CO3           CA           CA         CACO3        CACO3
                  ID     MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         M3/S
SAMPLES(FLAGS)           4(0)         2(0)         4(0)         5(0)         2(0)         3(0)         3(0)
           LOW           149.         183.           0.         108.         109.3        376.0        434.
          HIGH           205.         184.           0.         174.0        122.7        558.3        544.0
       AVERAGE           175.         184.           0.         134.4        116.0        460.5        475.0
      STD.DEV.            24.           1.           0.          29.2          9.5         91.9         60.1
   PERCNT:10TH
          25TH           156.                        0.         111.
   MEDIAN 50TH           173.         184.           0.         123.0        116.0        447.1        447.0
          75TH           194.                        0.         156.
          90TH
SECONDARY CODE                                              11L 10L

                         11103L       12102L       19103L       09107L       17203L       16306L       26009L       26304L
                         SODIUM     MAGNESIUM    POTASSIUM     FLUORIDE     CHLORIDE     SULPHATE      IRON         IRON
                       DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED     TOTAL       EXTRBLE.

                 SUBM     NA           MG           K            F            CL          SO4          FE           FE
                  ID     MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)           5(0)         5(0)         5(0)         5(0)         5(0)         5(0)         1(0)         4(0)
           LOW           190.          24.          4.1         1.070        292.         284.0         .84          .08
          HIGH           300.0         41.         25.0        10.38         476.0        431.0         .84          .31
       AVERAGE           226.2         33.0         9.24        3.812        355.60       331.2                      .210
      STD.DEV.            42.8          7.4         8.90        3.754         75.64        64.0                      .096
   PERCNT:10TH
          25TH           205.0         27.0         4.50        2.00         300.         285.                       .150
   MEDIAN 50TH           218.          34.0         5.3         2.36         330.00       296.                       .225
          75TH           218.          39.          7.3         3.25         380.         360.                       .270
          90TH
SECONDARY CODE          11L          11L          11L          06L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  54                          NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                          INDUSTRIAL MONITORING
STATION 20AL05EB2001    LAT. 53D 33M 48S  LONG. 113D 22M 33S   PR 3   UTM 12 342650E 5937350N  FOR MAR 25, 1981 TO AUG 08, 1984
GULF OIL CANADA LTD EDMONTON                FINAL EFFLUENT COMP.
S5 T53 R23 W4M

                          07105L      07205L      07562L      07021L      07906L       07905L       15421L      97160S
                         NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN     NITROGEN    PHOSFHORUS   DISCHARGE
                        DISSOLVED   DISSOLVED   DISSOLVED     TOTAL    PARTICULATE  PARTICULATE     TOTAL      INSTANT
                        NO3 & NO2    NITRITE     AMMONIA    KJELDAHL      TOTAL       (CALCD.)
                SUBM        N           N           N           N           N            N            P
                 ID       MG/L        MG/L        MG/L        MG/L        MG/L         MG/L         MG/L        M3/S
SAMPLES(FLAGS)            5(5)        5(5)        5(0)        5(0)        4(0)                      5(0)
           LOW            L.02        L.02        .044        .780        .450                      .145
          HIGH            L.050       L.050       .400        2.7         .68                       1.24
       AVERAGE                                    .145        1.804       .560                      .455
      STD.DEV.                                    .147        .692        .101                      .444
   PERCNT:10TH
          25TH            L.05        L.05        .049        1.700       .480                      .270
   MEDIAN 50TH            L.05        L.05        .110        1.800       .555                      .300
          75TH            L.05        L.05        .12         2.040       .640                      .320
          90TH
SECONDARY CODE                                    61L         15L                                   19L

                          10474L      10407L      10511L      10453L      14101L       97160S       97163S
                         RESIDUE     RESIDUE     RESIDUE     RESIDUE      SILICA     DISCHARGE    DISCHARGE
                          TOTAL    NONFILTRABLE  VOLATILE   FILTRABLE    REACTIVE     INSTANT        DAILY
                                                NONFILTR.                                            MEAN
                SUBM                            (CALCD.)                   SIO2
                 ID       MG/L        MG/L        MG/L        MG/L        MG/L         M3/S          CFS
SAMPLES(FLAGS)            4(0)        4(0)                    3(0)        5(0)                      5(0)
           LOW            1180.2      20.2                    1160.0      6.70                      .2725
          HIGH            1756.0      50.0                    1260.       14.5                      1.26
       AVERAGE            1357.0      30.5                    1200.0      10.48                     .5745
      STD.DEV.            270.3       13.9                    52.9        2.89                      .3963
   PERCNT:10TH
          25TH            1190.6      20.6                                9.7                       .35
   MEDIAN 50TH            1246.0      26.0                    1180.       9.7                       .45
          75TH            1523.5      40.5                                11.8                      .54
          90TH
SECONDARY CODE            71L         01L                                 02L

                          00205L      02074L      06537L      06524L      02001L       16101L       10701L      06608L
                          TOTAL     TURBIDITY    PHENOLIC     OIL AND      ODOUR      SULPHIDE     SURFACT.     CYANIDE
                        DISSOLVED                MATERIAL     GREASE     THRESHOLD    DISSOLVED    N-ALKYL
                          SOLIDS                                           NUMBER                  SULPHNTS.
                SUBM                             PHENOL                                   S           LAS          CN
                 ID       MG/L        NTU         MG/L        MG/L         TON          MG/L         MG/L         MG/L
SAMPLES(FLAGS)            5(0)        4(0)        4(0)        5(0)         3(0)         1(0)         2(0)
           LOW            1010.       9.0         .009        .8           1.           .33          2.54
          HIGH            1724.0      34.0        .090        7.0          100.         .33          2.75
       AVERAGE            1215.1      16.8        .047        3.180        34.                       2.645
      STD.DEV.            301.0       11.6        .037        2.453        57.                       .148
   PERCNT:10TH
          25TH            1017.       10.5        .017        1.300
   MEDIAN 50TH            1071.4      12.0        .044        3.1          2.                        2.645
          75TH            1253.       23.0        .076        3.7
          90TH
SECONDARY CODE                                                21L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  55                      NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                     INDUSTRIAL MONITORING
STATION 20AL05EB2001    LAT. 53D 33M 48S  LONG. 113D 22M 33S   PR 3   UTM 12 342650E 5937350N  FOR MAR 25, 1981 TO AUG 08, 1984
GULF OIL CANADA LTD EDMONTON              FINAL EFFLUENT COMP.
S5 T53 R23 W4M
                        08304L       08202L       06107L       06154L       06001L       06051L       06006L       06905L
                        OXYGEN       OXYGEN       CARBON       CARBON       CARBON       CARBON       CARBON       CARBON
                         TOTAL      BIOCHEM.    DISSOLVED    DISSOLVED      TOTAL        TOTAL      TOTAL       PARTICULATE
                          COD      DEMAND-BOD    ORGANIC     INORGANIC     ORGANIC     INORGANIC                  TOTAL
                  SUBM    O2           O2           C            C            C            C            C            C
                   ID    MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)           5(0)                      4(0)         4(0)         1(0)                                   4(0)
           LOW           40.3                       1.0         25.          53.0                                    2.95
          HIGH          204.0                      72.          41.0         53.0                                    6.83
       AVERAGE           85.5                      23.10        33.07                                                4.33
      STD.DEV.           67.1                      32.97         7.02                                                1.72
  PERCNT:10TH
          25TH           53.0                       3.70        27.50                                                3.25
   MEDIAN 50TH           60.3                       9.70        33.15                                                3.78
          75TH           70.0                      42.50        38.65                                                5.42
          90TH
SECONDARY CODE          01L                                                07L
                        24101L       24009L       24302L       80015L       80011L       27009L       27302L       47304L
                       CHROMIUM     CHROMIUM     CHROMIUM     MERCURY      MERCURY      COBALT       COBALT       SILVER
                      HEXAVALENT    TOTAL        EXTRBLE.     TOTAL        TOTAL        TOTAL        EXTRBLE.     EXTRBLE.

                  SUBM    CR           CR           CR           HG           HG           CO           CO           AG
                   ID    MG/L         MG/L         MG/L         MG/L         UG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)           3(2)         5(0)                      5(4)                      5(1)                      1(1)
           LOW           L.001         .204                      .0001                     .003                     L.02
          HIGH            .03         1.34                      L.0001                     .010                     L.02
       AVERAGE            .011*        .589                      .0001*                    .006*
      STD.DEV.            .017*        .470                      .0000*                    .004*
  PERCNT:10TH
          25TH                         .242                     L.0001                     .003
   MEDIAN 50TH           L.001         .422                     L.0001                     .005
          75TH                         .738                     L.0001                    L.01
          90TH
SECONDARY CODE
                        29009L       29305L       28009L       28302L       48009L       48302L       82009L       82302L
                        COPPER       COPPER       NICKEL       NICKEL       CADMIUM      CADMIUM      LEAD         LEAD
                         TOTAL       EXTRBLE.     TOTAL        EXTRBLE.     TOTAL        EXTRBLE.     TOTAL        EXTRBLE.

                  SUBM    CU           CU           NI           NI           CD           CD           PB           PB
                   ID    MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)           5(0)                      5(1)                      5(2)                      2(0)         3(1)
           LOW            .012                      .011                     L.001                      .010        L.003
          HIGH            .122                     L.02                      L.01                       .012         .02
       AVERAGE            .041                      .015*                     .004*                     .011         .014*
      STD.DEV.            .046                      .004*                     .004*                     .001         .009*
  PERCNT:10TH
          25TH            .017                      .011                      .002
   MEDIAN 50TH            .019                      .016                      .004                      .011         .018
          75TH            .033                      .018                      .005
          90TH
SECONDARY CODE
```

```
REQUEST 0010 -  0012 PAGE  56                        NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                       INDUSTRIAL MONITORING
STATION 20AL05EB2001    LAT. 53D 33M 48S  LONG. 113D 22M 33S   PR 3   UTM 12 342650E 5937350N  FOR MAR 25, 1981 TO AUG 08, 1984
GULF OIL CANADA LTD EDMONTON                FINAL EFFLUENT COMP.
S5 T53 R23 W4M

                           30009L       30305L       25003L       25304L       23009L       42304L       42009L       51003L
                            ZINC         ZINC       MANGANESE    MANGANESE    VANADIUM    MOLYBDENUM   MOLYBDENUM   ANTIMONY
                           TOTAL       EXTRBLE.       TOTAL      EXTRBLE.       TOTAL      EXTRBLE.      TOTAL        TOTAL

                   SUBM      ZN           ZN           MN           MN           V            MO           MO           SB
                    ID      MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)              5(0)                      5(0)                      4(1)                      4(0)         1(1)
           LOW              .179                      .093                      .007                      .007        L.001
          HIGH             1.270                      .306                      .012                      .02         L.001
       AVERAGE              .495                      .162                      .010*                     .013
      STD.DEV.              .454                      .086                      .002*                     .006
   PERCNT:10TH
          25TH              .188                      .112                      .008                      .008
   MEDIAN 50TH              .328                      .124                      .009*                     .012
          75TH              .51                       .176                      .011*                     .017
          90TH
SECONDARY CODE

                           33005L       33104L       34005L       34102L       13111L       13306L       04102L       04304L
                          ARSENIC      ARSENIC      SELENIUM     SELENIUM     ALUMINUM     ALUMINUM     BERYLLIUM    BERYLLIUM
                           TOTAL      DISSOLVED     TOTAL       DISSOLVED    DISSOLVED     EXTRBLE.    DISSOLVED     EXTRBLE.

                   SUBM      AS           AS           SE           SE           AL           AL           BE           BE
                    ID      MG/L         MG/L         MG/L         MG/L         UG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)              3(0)                      3(2)                      1(0)         3(0)         1(0)         3(3)
           LOW              .0036                    L.0002                     620.          .130         .005        L.001
          HIGH              .0068                     .007                      620.          .757         .005        L.001
       AVERAGE              .0048                     .0025*                                  .345
      STD.DEV.              .0017                     .0039*                                  .357
   PERCNT:10TH
          25TH
   MEDIAN 50TH              .004                     L.0002                                   .147                     L.001
          75TH
          90TH
SECONDARY CODE                                        07L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  57                          NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                          INDUSTRIAL MONITORING
STATION 20AL05EB2600    LAT. 53D 34M 26S  LONG. 113D 20M 58S   PR 3   UTM 12 344450E 5938450N  FOR APR 29, 1980 TO FEB 17, 1983
UNIROYAL LTD EDMONTON                            FINAL EFFLUENT GRAB
SE S17 T53 R23 W4M

                          02061F        10301L        10301F       10151L       10101L       02041L       97160S       97163S
                        TEMPERATURE       PH            PH       ALKALINITY   ALKALINITY    SPECIFIC    DISCHARGE     DISCHARGE
                         OF WATER                                  PHENOL        TOTAL      CONDUCT.     INSTANT        DAILY
                    SUBM                                        PHTHALEIN                                               MEAN
                     ID     DEG.C       PH UNITS      PH UNITS      CACO3        CACO3
SAMPLES(FLAGS)              6(0)          6(0)          1(0)        MG/L         MG/L        US/CM        M3/S          CFS
           LOW              26.0           7.0           8.4        6(1)         6(0)        6(0)                      5(0)
          HIGH              71.0           8.6           8.4          .0          65.         399.                      .027
       AVERAGE              57.1                                     5.          139.        1294.                      .03
      STD.DEV.              16.2                                      2.0*         98.0        707.                      .0288
  PERCNT:10TH                                                         2.3*         26.0        325.                      .0016
          25TH              56.5           7.5
   MEDIAN 50TH              61.5           8.05                       .0          82.          507.                      .027
          75TH              66.0           8.6                       1.7          93.5         599.                      .03
          90TH                                                       L4.         115.0         843.                      .03
SECONDARY CODE

                          06201L        06202L        06301L       20103L       20105L       10602L       10604L       97160S
                        BICARBONT.    BICARBONT.     CARBONATE     CALCIUM      CALCIUM     HARDNESS     HARDNESS     DISCHARGE
                         (CALCD.)      (CALCD.)      (CALCD.)     DISSOLVED    DISSOLVED      TOTAL        TOTAL       INSTANT
                                                                                (CALCD.)     (CALCD.)
                   SUBM    HCO3          HCO3          CO3            CA           CA          CACO3        CACO3
                    ID    MG/L          MG/L          MG/L          MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)              6(1)                        6(1)         4(0)         2(0)         3(0)         3(0)         M3/S
           LOW               71.                          0.          42.0         36.6        165.0        141.
          HIGH              157.                          6.          91.         111.8        334.3        432.
       AVERAGE              114.*                         2.*         56.5         74.2        230.0        247.7
      STD.DEV.               31.*                         3.*         23.3         53.2         91.2        160.3
  PERCNT:10TH
          25TH              100.                          0.          42.5
   MEDIAN 50TH              109.                          2.          46.5         74.2        190.7      .  3.0
          75TH              140.                         Q5.          70.5
          90TH
SECONDARY CODE                                                 11L 10L

                          11103L        12102L        19103L       09107L       17203L       16306L       26009L       26304L
                          SODIUM       MAGNESIUM     POTASSIUM     FLUORIDE     CHLORIDE     SULPHATE      IRON         IRON
                         DISSOLVED     DISSOLVED     DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED      TOTAL      EXTRBLE.

                  SUBM      NA            MG            K            F            CL           SO4
                   ID      MG'           MG/L          MG/L         MG/L         MG/L         MG/L          FE           FE
SAMPLES(FLAGS)              6            6(0)          6(0)         6(1)         6(0)         6(0)         MG/L         MG/L
           LOW              1y.           12.           1.5         L.10          54.          25.         1(0)         5(0)
          HIGH              87.           37.          19.0          .49         292.         170.         3.84          .89
       AVERAGE              38.5          20.2          5.20         .215*       120.00         68.0        3.84         3.79
      STD.DEV.              24.9           9.6          6.84         .143*        86.53         54.2                     1.638
  PERCNT:10TH                                                                                                            1.229
          25TH              25.           14.           1.8          .11          78.          25.
   MEDIAN 50TH              29.5          16.0          2.30         .190         91.00        56.0                       .97
          75TH              41.           26.           4.3          .21         114.          76.                        1.01
          90TH                                                                                                           1.53
SECONDARY CODE     11L           11L           11L           06L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  58                      NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                        INDUSTRIAL MONITORING
STATION 20AL05EB2600    LAT. 53D 34M 26S  LONG. 113D 20M 58S   PR 3   UTM 12 344450E 5938450N  FOR APR 29, 1980 TO FEB 17, 1983
UNIROYAL LTD EDMONTON                        FINAL EFFLUENT GRAB
SE S17 T53 R23 W4M

                          07105L      07205L      07562L      07021L      07906L       07905L       15421L      97160S
                          NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN     NITROGEN     PHOSPHORUS  DISCHARGE
                          DISSOLVED   DISSOLVED   DISSOLVED   TOTAL       PARTICULATE  PARTICULATE  TOTAL        INSTANT
                          NO3 & NO2   NITRITE     AMMONIA     KJELDAHL    TOTAL        (CALCD.)
                    SUBM    N           N           N           N           N            N            P
                    ID    MG/L        MG/L        MG/L        MG/L        MG/L         MG/L         MG/L        M3/S
SAMPLES(FLAGS)             6(3)        6(5)        6(0)        6(0)        3(0)                      6(0)
           LOW             L.05         .023        .283       1.880        .38                       .820
          HIGH              .30        L.05        5.550       9.100        .50                      4.500
       AVERAGE              .132*       .045*      2.093       4.077        .450                     2.031
      STD.DEV.              .123*       .011*      1.943       2.592        .062                     1.412
  PERCNT:10TH
          25TH             L.05        L.05         .750       2.630                                  .887
    MEDIAN 50TH             .055*      L.050       1.518       3.375        .47                      1.725
          75TH              .280       L.05        2.94        4.1                                   2.530
          90TH
SECONDARY CODE                                    61L         15L                                   19L

                          10474L      10407L       10511L      10453L      14101L       97160S       97163S
                          RESIDUE     RESIDUE      RESIDUE     RESIDUE     SILICA       DISCHARGE    DISCHARGE
                          TOTAL       NONFILTRABLE VOLATILE    FILTRABLE   REACTIVE      INSTANT     DAILY
                                                   NONFILTR.                                         MEAN
                    SUBM                           (CALCD.)                SIO2
                    ID    MG/L        MG/L         MG/L        MG/L        MG/L         M3/S         CFS
SAMPLES(FLAGS)             6(0)        6(0)                     4(0)        6(0)                     5(0)
           LOW            398.0        17.                     410.          2.7                      .027
          HIGH           1236.         86.                    1140.          9.2                      .03
       AVERAGE            639.5        46.2                    697.5         4.75                     .0288
      STD.DEV.            323.2        27.8                    321.7         2.64                     .0016
  PERCNT:10TH
          25TH            427.         22.                     465.0         3.0                      .027
    MEDIAN 50TH           498.5        43.5                    620.0         3.40                     .03
          75TH            779.         65.                     930.0         6.8                      .03
          90TH
SECONDARY CODE           71L          01L                                  02L

                          00205L      02074L      06537L      06524L      02001L       16101L       10701L      06608L
                          TOTAL       TURBIDITY    PHENOLIC   OIL AND      ODOUR       SULPHIDE      SURFACT.     CYANIDE
                          DISSOLVED                MATERIAL   GREASE      THRESHOLD    DISSOLVED    N-ALKYL.
                          SOLIDS                                          NUMBER                    SULPHNTS.
                    SUBM                          PHENOL                                 S            LAS       CN
                    ID    MG/L        NTU         MG/L        MG/L         TON          MG/L         MG/L       MG/L
SAMPLES(FLAGS)             6(0)        5(0)        5(0)        5(0)                                  6(0)        1(0)
           LOW            209.          5.5         .115        .6                                    .12        .003
          HIGH            666.         26.0         .975       9.0                                   3.24        .003
       AVERAGE            381.0        15.3         .418       3.280                                 1.132
      STD.DEV.            171.0         7.5         .333       3.339                                 1.293
  PERCNT:10TH
          25TH            254.         13.0         .260       1.4                                    .15
    MEDIAN 50TH           331.5        14.0         .291       2.2                                    .540
          75TH            494.         18.0         .450       3.2                                   2.20
          90TH
SECONDARY CODE                        73L                     21L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  59                        NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                       INDUSTRIAL MONITORING
STATION 20AL05EB2600    LAT. 53D 34M 26S  LONG. 113D 20M 58S   PR 3   UTM 12 344450E 5938450N  FOR APR 29, 1980 TO FEB 17, 1983
UNIROYAL LTD EDMONTON                          FINAL EFFLUENT GRAB
SE S17 T53 R23 W4M

                          08304L      08202L      06107L      06154L      06001L      06051L      06006L      06905L
                          OXYGEN      OXYGEN      CARBON      CARBON      CARBON      CARBON      CARBON      CARBON
                           TOTAL     BIOCHEM.    DISSOLVED   DISSOLVED     TOTAL       TOTAL      TOTAL     PARTICULATE
                            COD     DEMAND-BOD    ORGANIC    INORGANIC    ORGANIC    INORGANIC                 TOTAL
                 SUBM       O2          O2          C           C           C           C           C           C
                  ID       MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)             6(0)                    4(0)        4(0)        2(0)        1(0)        1(0)        3(0)
           LOW             36.5                     3.5        17.0        10.          9.         19.          2.54
          HIGH            136.7                   116.         35.         35.5         9.         19.          4.71
       AVERAGE             63.2                    36.05       23.60       22.75                                3.42
      STD.DEV.             37.0                    53.60        7.91       18.03                                1.14
   PERCNT:10TH
          25TH             41.5                     5.60       18.50
   MEDIAN 50TH             52.5                    12.35       21.20       22.75                                3.00
          75TH             59.4                    66.50       28.70
          90TH
SECONDARY CODE          01L                                             07L

                          24101L      24009L      24302L      80015L      80011L      27009L      27302L      47304L
                         CHROMIUM    CHROMIUM    CHROMIUM     MERCURY     MERCURY     COBALT      COBALT      SILVER
                        HEXAVALENT    TOTAL      EXTRBLE.     TOTAL       TOTAL       TOTAL      EXTRBLE.    EXTRBLE.

                 SUBM       CR          CR          CR          HG          HG          CO          CO          AG
                  ID       MG/L        MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)             3(2)        5(0)                    5(3)                    6(3)                    1(1)
           LOW             L.001       .006                    L.0001                  L.001                   L.02
          HIGH             .22         .066                    .0018                   L.01                    L.02
       AVERAGE             .074*       .034                    .0005*                  .003*
      STD.DEV.             .126*       .028                    .0007*                  .003*
   PERCNT:10TH
          25TH                         .011                    L.0001                  L.001
   MEDIAN 50TH             L.001       .026                    L.0001                  .003
          75TH                         .059                    .0003                   .004
          90TH
SECONDARY CODE

                          29009L      29305L      28009L      28302L      48009L      48302L      82009L      82302L
                          COPPER      COPPER      NICKEL      NICKEL      CADMIUM     CADMIUM      LEAD        LEAD
                           TOTAL     EXTRBLE.     TOTAL      EXTRBLE.     TOTAL      EXTRBLE.     TOTAL      EXTRBLE.

                 SUBM       CU          CU          NI          NI          CD          CD          PB          PB
                  ID       MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)             6(0)                    6(0)                    5(4)                    3(0)        3(2)
           LOW             .020                    .007                    L.001                   .006        L.003
          HIGH             .077                    .028                    L.01                    .025        L.02
       AVERAGE             .051                    .016                    .003*                   .013        .009*
      STD.DEV.             .022                    .008                    .004*                   .010        .009*
   PERCNT:10TH
          25TH             .031                    .007                    L.001
   MEDIAN 50TH             .053                    .017                    L.001                   .008        .005
          75TH             .072                    .021                    .002
          90TH
SECONDARY CODE
```

```
REQUEST 0010 -  0012 PAGE  60                        NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                        INDUSTRIAL MONITORING
STATION 20AL05EB2600    LAT. 53D 34M 26S  LONG. 113D 20M 58S   PR 3   UTM 12 344450E 5938450N  FOR APR 29, 1980 TO FEB 17, 1983
UNIROYAL LTD EDMONTON                        FINAL EFFLUENT GRAB
SE S17 T53 R23 W4M

                        30009L     30305L     25003L     25304L     23009L     42304L     42009L     51003L
                         ZINC       ZINC     MANGANESE  MANGANESE  VANADIUM  MOLYBDENUM MOLYBDENUM  ANTIMONY
                         TOTAL    EXTRBLE.     TOTAL    EXTRBLE.     TOTAL    EXTRBLE.     TOTAL      TOTAL

                 SUBM     ZN         ZN         MN         MN         V          MO         MO         SB
                  ID     MG/L       MG/L       MG/L       MG/L       MG/L       MG/L       MG/L       MG/L
SAMPLES(FLAGS)            6(0)                  6(0)                  2(0)                  4(4)
           LOW            .025                  .129                  .003                  L.001
          HIGH            .997                 1.620                  .003                  L.02
       AVERAGE            .443                  .514                  .003
      STD.DEV.            .374                  .554                  .000
   PERCNT:10TH
          25TH            .062                  .242                                        L.001
   MEDIAN 50TH            .431                  .322                  .003                  L.001
          75TH            .71                   .451                                        L.010
          90TH
SECONDARY CODE

                        33005L     33104L     34005L     34102L     13111L     13306L     04102L     04304L
                        ARSENIC    ARSENIC    SELENIUM   SELENIUM   ALUMINUM   ALUMINUM   BERYLLIUM  BERYLLIUM
                        TOTAL     DISSOLVED   TOTAL     DISSOLVED  DISSOLVED  EXTRBLE.   DISSOLVED  EXTRBLE.

                 SUBM     AS         AS         SE         SE         AL         AL         BE         BE
                  ID     MG/L       MG/L       MG/L       MG/L       UG/L       MG/L       MG/L       MG/L
SAMPLES(FLAGS)            1(0)                  1(0)                             3(0)                  3(3)
           LOW            .0045                 .0003                            .104                  L.001
          HIGH            .0045                 .0003                            .661                  L.001
       AVERAGE                                                                   .382
      STD.DEV.                                                                   .279
   PERCNT:10TH
          25TH
   MEDIAN 50TH                                                                   .382                  L.001
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  61                              NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                            INDUSTRIAL MONITORING
STATION 20AL05EB2700     LAT. 53D 34M 19S  LONG. 113D 21M  3S   PR 3   UTM 12 344350E 5938250N  FOR APR 28, 1980 TO AUG 09, 1984
FIBERGLASS CANADA LTD EDMONTON              FINAL EFFLUENT GRAB
SE S17 T53 R23 W4M

                        02061F        10301L       10301F       10151L       10101L       02041L       971609       971639
                      TEMPERATURE       PH           PH       ALKALINITY   ALKALINITY    SPECIFIC    DISCHARGE    DISCHARGE
                       OF WATER                                 PHENOL        TOTAL      CONDUCT.     INSTANT        DAILY
                                                              PHTHALEIN                                              MEAN
                 SUBM
                  ID    DEG.C       PH UNITS     PH UNITS       CACO3        CACO3        US/CM        M3/S          CFS
                                                                MG/L         MG/L
SAMPLES(FLAGS)          12(0)        14(0)         1(0)         12(1)        14(0)        14(0)                      13(0)
           LOW           13.0          7.04         8.6           .0          53.1         275.                        .22
          HIGH           45.0          8.4          8.6         L4.2         151.          474.                        .62
       AVERAGE           28.3                                     .4*        102.2         362.                        .3595
      STD.DEV.            7.6                                    1.2*         30.7          77.                        .1083
   PERCNT:10TH           23.0          7.6                        .0          60.0         277.                        .22
          25TH           24.5          7.8                        .0          86.          294.                        .30
   MEDIAN 50TH           28.5          7.95                       .0          95.8         326.                        .37
          75TH           32.0          8.20                       .0         137.          441.                        .41
          90TH           34.           8.3                        .0         145.          470.                        .45
SECONDARY CODE

                        06201L        06202L       06301L       20103L       20105L       10602L       10604L       971609
                      BICARBONT.    BICARBONT.    CARBONATE     CALCIUM      CALCIUM     HARDNESS     HARDNESS     DISCHARGE
                       (CALCD.)      (CALCD.)     (CALCD.)     DISSOLVED    DISSOLVED      TOTAL        TOTAL       INSTANT
                                                                             (CALCD.)     (CALCD.)
                 SUBM   HCO3          HCO3          CO3           CA           CA          CACO3        CACO3
                  ID    MG/L          MG/L          MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)          12(1)         5(0)         12(1)        13(0)         2(0)        10(0)         5(0)          M3/S
           LOW           65.           97.           0.          25.          27.8        119.3        119.0
          HIGH          184.          184.          Q5.          65.          32.3        208.8        183.9
       AVERAGE          128.*         124.           0.*         42.5         30.0        163.7        136.9
      STD.DEV.           40.*          35.           1.*         13.5          3.1         32.5         26.7
   PERCNT:10TH           73.                         0.          28.0                      124.7
          25TH          104.          105.           0.          31.                       130.9        124.
   MEDIAN 50TH          124.          111.           0.          47           30.0        166.8        126.
          75TH          169.          124.           0.          49.                       191.1        131.6
          90TH          177.                         0.          65.                       206.1
SECONDARY CODE                                          11L 10L

                        11103L        12102L       19103L       09107L       17203L       16306L       26009L       26304L
                        SODIUM      MAGNESIUM     POTASSIUM     FLUORIDE     CHLORIDE     SULPHATE       IRON         IRON
                       DISSOLVED    DISSOLVED     DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED      TOTAL       EXTRBLE.
                 SUBM    NA            MG            K             F           CL           SO4           FE           FE
                  ID    MG/L          MG/L          MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)          14(0)         14(0)        14(0)        14(0)        14(0)        14(0)         3(0)        11(0)
           LOW            2.0           7.            .9          .13          4.          45.           .13          .14
          HIGH           15.           21.          22.0         1.20         35.0        110.          1.95         1.87
       AVERAGE            8.5          12.9          2.95         .878         9.61         69.0          .923         .706
      STD.DEV.            3.3           3.2          5.50         .297         8.24         23.1          .932         .524
   PERCNT:10TH            6.           10.           1.00         .32          5.           46.                        .19
          25TH            6.6          11.           1.10         .88          5.           52.0                        .25
   MEDIAN 50TH            8.0          12.9          1.45         .935         6.00         60.5          .69          .590
          75TH            9.           14.           2.0         1.03         13.           80.                        1.060
          90TH           13.           15.3          2.1         1.18         15.          108.7                        1.21
SECONDARY CODE          11L           11L          11L          06L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  62                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB2700    LAT. 53D 34M 19S  LONG. 113D 21M  3S   PR 3   UTM 12 344350E 5938250N  FOR APR 28, 1980 TO AUG 09, 1984
FIBERGLASS CANADA LTD EDMONTON            FINAL EFFLUENT GRAB
SE S17 T53 R23 W4M

                             07105L       07205L       07562L       07021L       07906L       07905L       15421L       97160S
                            NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN    PHOSPHORUS   DISCHARGE
                            DISSOLVED    DISSOLVED    DISSOLVED     TOTAL     PARTICULATE  PARTICULATE    TOTAL       INSTANT
                            NO3 & NO2    NITRITE      AMMONIA      KJELDAHL      TOTAL       (CALCD.)
                    SUBM       N            N            N            N            N            N            P
                     ID       MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         M3/S
SAMPLES(FLAGS)               14(0)        14(5)        14(0)        13(0)         9(0)                     13(1)
           LOW                 .25         L.02          .698        1.025          .03                     L.02
          HIGH                2.05         5.00         2.24         8.880          .32                      .430
       AVERAGE                 .868         .794*       1.417        3.078          .164                     .144*
      STD.DEV.                 .542        1.482*        .527        2.067          .112                     .127*
   PERCNT:10TH                 .40         L.05          .850        1.400                                   .02
          25TH                 .450        L.050         .920        1.550          .07                      .075
   MEDIAN 50TH                 .620         .105        1.420        2.9            .12                      .094
          75TH                1.4           .55         1.920        3.100          .26                      .17
          90TH                1.5          3.3          2.100        5.340                                   .380
SECONDARY CODE                                         61L          15L                                     19L

                             10474L       10407L       10511L       10453L       14101L       97160S       97163S
                            RESIDUE      RESIDUE      RESIDUE      RESIDUE      SILICA      DISCHARGE    DISCHARGE
                             TOTAL     NONFILTRABLE   VOLATILE    FILTRABLE    REACTIVE      INSTANT       DAILY
                                                     NONFILTR.                                              MEAN
                    SUBM                              (CALCD.)                   SIO2
                     ID      MG/L         MG/L         MG/L         MG/L         MG/L         M3/S          CFS
SAMPLES(FLAGS)               13(0)        14(0)                     10(0)        14(0)                     13(0)
           LOW                220.          13.                      180.          3.50                      .22
          HIGH                537.         247.                      390.          7.9                       .62
       AVERAGE                377.2         69.6                     305.6         5.56                      .3595
      STD.DEV.                108.0         70.0                      67.5         1.47                      .1083
   PERCNT:10TH                222.          14.                      193.0         3.8                       .22
          25TH                287.          22.                      280.0         4.1                       .30
   MEDIAN 50TH                377.          49.5                     330.0         5.75                      .37
          75TH                455.          97.                      350.          6.7                       .41
          90TH                536.         187.8                     370.0         7.3                       .45
SECONDARY CODE               71L          01L                       51L          02L

                             00205L       02074L       06537L       06524L       02001L       16101L       10701L       06608L
                             TOTAL       TURBIDITY    PHENOLIC     OIL AND       ODOUR       SULPHIDE     SURFACT.     CYANIDE
                            DISSOLVED                 MATERIAL     GREASE      THRESHOLD    DISSOLVED     N-ALKYL
                             SOLIDS                                             NUMBER                   SULFHNTS.
                    SUBM                               PHENOL                                   S           LAS          CN
                     ID      MG/L         NTU          MG/L         MG/L          TON          MG/L         MG/L         MG/L
SAMPLES(FLAGS)               13(0)        13(0)        14(1)        14(0)         1(0)                     12(0)         3(2)
           LOW                156.          2.0        L.002          .37          1.                        .09        L.002
          HIGH                291.         35.0          .328       16.0           1.                        .70         .007
       AVERAGE                212.7        11.2          .061*       4.019                                   .258        .0037*
      STD.DEV.                 43.7         9.6          .109*       3.904                                   .169        .0029*
   PERCNT:10TH                159.9         2.4          .004         .5                                     .11
          25TH                177.          3.0          .005        2.4                                     .150
   MEDIAN 50TH                206.          9.0          .010        2.850                                   .200       L.0020
          75TH                253.         15.0          .054        5.                                      .335
          90TH                260.         20.0          .295        6.2                                     .38
SECONDARY CODE                            73L                       21L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  63                          NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                         INDUSTRIAL MONITORING
STATION 20AL05EB2700    LAT. 53D 34M 19S  LONG. 113D 21M  3S   PR 3   UTM 12 344350E 5938250N  FOR APR 28, 1980 TO AUG 09, 1984
FIBERGLASS CANADA LTD EDMONTON              FINAL EFFLUENT GRAB
SE S17 T53 R23 W4M

                        08304L      08202L      06107L      06154L      06001L      06051L      06006L      06905L
                        OXYGEN      OXYGEN      CARBON      CARBON      CARBON      CARBON      CARBON      CARBON
                          TOTAL     BIOCHEM.    DISSOLVED   DISSOLVED   TOTAL       TOTAL       TOTAL       PARTICULATE
                          COD       DEMAND-BOD  ORGANIC     INORGANIC   ORGANIC     INORGANIC               TOTAL
                   SUBM   02           02       C           C           C           C           C           C
                    ID  MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           14(2)                   9(0)        9(0)        4(0)        1(0)        1(0)        9(0)
           LOW           L5.                     1.30        21.0         4.5        13.         26.           .61
          HIGH           56.3                   18.3        183.00       15.8        13.         26.          4.90
       AVERAGE           20.2*                   6.73        48.92       10.72                               2.46
      STD.DEV.           14.4*                   6.42        50.76        4.86                               1.34
  PERCNT:10TH            L5.0
          25TH           10.                     2.3         28.          7.05                               1.71
   MEDIAN 50TH           17.0                    4.2         34.3        11.30                               2.26
          75TH           25.0                    7.          39.         14.40                               2.80
          90TH           42.0
SECONDARY CODE          01L                                              07L

                        24101L      24009L      24302L      80015L      80011L      27009L      27302L      47304L
                        CHROMIUM    CHROMIUM    CHROMIUM    MERCURY     MERCURY     COBALT      COBALT      SILVER
                        HEXAVALENT  TOTAL       EXTRBLE.    TOTAL       TOTAL       TOTAL       EXTRBLE.    EXTRBLE.

                   SUBM  CR         CR          CR          HG          HG          CO          CO          AG
                    ID  MG/L        MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)          12(11)      13(2)                   13(11)       1(1)       13(9)                    3(3)
           LOW           L.001        .007                    .0001     L.02         L.001                  L.02
          HIGH            .26         .28                     .0003     L.02          .03                   L.02
       AVERAGE            .024*       .032*                   .0001*                  .006*
      STD.DEV.            .074*       .075*                   .0001*                  .008*
  PERCNT:10TH            L.001        .007                  L.0001                   L.001
          25TH           L.001        .008                  L.0001                   L.001
   MEDIAN 50TH           L.001        .009                  L.0001                   L.001                  L.02
          75TH           L.005        .011                  L.0001                    .009
          90TH           L.01         .024                  L.0001                   L.01
SECONDARY CODE

                        29009L      29305L      28009L      28302L      48009L      48302L      82009L      82302L
                        COPPER      COPPER      NICKEL      NICKEL      CADMIUM     CADMIUM     LEAD        LEAD
                         TOTAL      EXTRBLE.    TOTAL       EXTRBLE.    TOTAL       EXTRBLE.    TOTAL       EXTRBLE.

                   SUBM  CU         CU          NI          NI          CD          CD          PB          PB
                    ID  MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)          13(0)                   13(3)                   13(12)                   5(3)        8(5)
           LOW            .006                  L.001                   L.001                   L.003       L.003
          HIGH            .024                   .052                   L.01                     .008        .020
       AVERAGE            .013                   .020*                   .003*                   .004*       .014*
      STD.DEV.            .006                   .015*                   .004*                   .002*       .008*
  PERCNT:10TH             .007                   .007                   L.001
          25TH            .008                   .012                   L.001                   L.003        .006*
   MEDIAN 50TH            .012                   .017                   L.001                   L.003        .017*
          75TH            .014                   .024                    .005                    .005       L.020
          90TH            .024                   .05                    L.01
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0010 -  0012 PAGE  64                      NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                    INDUSTRIAL MONITORING
STATION 20AL05EB2700    LAT. 53D 34M 19S  LONG. 113D 21M  3S   PR 3   UTM 12 344350E 5938250N  FOR APR 28, 1980 TO AUG 09, 1984
FIBERGLASS CANADA LTD EDMONTON             FINAL EFFLUENT GRAB
SE S17 T53 R23 W4M

                          30009L      30305L      25003L      25304L      23009L      42304L      42009L      51003L
                           ZINC        ZINC      MANGANESE   MANGANESE   VANADIUM   MOLYBDENUM  MOLYBDENUM   ANTIMONY
                          TOTAL      EXTRBLE.     TOTAL      EXTRBLE.     TOTAL      EXTRBLE.     TOTAL       TOTAL

                  SUBM     ZN          ZN          MN          MN          V           MO          MO          SB
                   ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            13(0)                   12(0)                   10(7)                   11(10)      2(0)
           LOW             .018                    .021                   L.002                   L.001       .008
          HIGH             .200                    .168                   L.01                    L.02        .014
       AVERAGE             .049                    .059                    .005*                   .007*      .0110
      STD.DEV.             .050                    .042                    .004*                   .009*      .0042
   PERCNT:10TH             .019                    .027                   L.002                   L.001
          25TH             .028                    .030                   L.002                   L.001
   MEDIAN 50TH             .032                    .047                    .002*                  L.001       .0110
          75TH             .037                    .073                    .009                   L.02
          90TH             .094                    .098                   L.010                   L.02
SECONDARY CODE

                          33005L      33104L      34005L      34102L      13111L      13306L      04102L      04304L
                          ARSENIC     ARSENIC    SELENIUM    SELENIUM    ALUMINUM    ALUMINUM    BERYLLIUM   BERYLLIUM
                          TOTAL      DISSOLVED   TOTAL       DISSOLVED   DISSOLVED   EXTRBLE.    DISSOLVED    EXTRBLE.

                  SUBM     AS          AS          SE          SE          AL          AL          BE          BE
                   ID     MG/L        MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            6(0)                    6(4)                    2(0)        8(0)        2(2)        8(8)
           LOW            .0003                   L.0002                  550.         .257       L.005       L.001
          HIGH            .021                     .011                   610.         .640       L.005       L.001
       AVERAGE            .0061                    .0031*                 580.00       .458
      STD.DEV.            .0088                    .0047*                  42.43       .155
   PERCNT:10TH
          25TH            .0005                   L.0002                               .322                   L.001
   MEDIAN 50TH            .0009                   L.0002                  580.00       .451       L.005       L.001
          75TH            .013                     .007                                .610                   L.001
          90TH
SECONDARY CODE                                    07L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  65                      NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                     INDUSTRIAL MONITORING
STATION 20AL05EB2701    LAT. 53D 34M 19S  LONG. 113D 21M  3S   PR 3   UTM 12 344350E 5938250N  FOR JUL 28, 1981 TO AUG 08, 1984
FIBERGLASS CANADA LTD EDMONTON            FINAL EFFLUENT COMP.
SE S17 T53 R23 W4M

                            02061F      10301L      10301F      10151L      10101L      02041L      97160S      97163S
                          TEMPERATURE     PH          PH      ALKALINITY  ALKALINITY   SPECIFIC   DISCHARGE   DISCHARGE
                          OF WATER                              PHENOL      TOTAL      CONDUCT.    INSTANT      DAILY
                                                              PHTHALEIN                                          MEAN
                     SUBM                                       CACO3       CACO3
                      ID    DEG.C      PH UNITS    PH UNITS     MG/L        MG/L        US/CM       M3/S         CFS
SAMPLES(FLAGS)                          4(0)                    3(0)        4(0)        4(0)                     4(0)
           LOW                          7.13                      .0        71.7        307.                     .22
          HIGH                          8.0                      3.3       169.         577.                     .45
       AVERAGE                                                   1.1       105.6        449.                     .3650
      STD.DEV.                                                   1.9        44.1        114.                     .1008
  PERCNT:10TH
          25TH                          7.46                                75.7        365.                     .3000
   MEDIAN 50TH                          7.90                      .0        90.9        456.                     .3950
          75TH                          8.00                               135.5        533.                     .4300
          90TH
SECONDARY CODE

                            06201L      06202L      06301L      20103L      20105L      10602L      10604L      97160S
                          BICARBONT.  BICARBONT.  CARBONATE    CALCIUM     CALCIUM    HARDNESS    HARDNESS   DISCHARGE
                           (CALCD.)    (CALCD.)    (CALCD.)   DISSOLVED   DISSOLVED     TOTAL       TOTAL      INSTANT
                                                                          (CALCD.)    (CALCD.)
                     SUBM   HCO3        HCO3        CO3          CA          CA        CACO3       CACO3
                      ID    MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        M3/S
SAMPLES(FLAGS)              3(0)        2(0)        3(0)        4(0)        1(0)        3(0)        2(0)
           LOW               79.         97.          0.        32.0        31.7       137.5       131.9
          HIGH              206.        206.          4.        68.         31.7       240.4       137.0
       AVERAGE              137.        152.          1.        48.5                   193.6       134.4
      STD.DEV.               64.         77.          2.        18.2                    52.0         3.6
  PERCNT:10TH
          25TH                                                  33.1
   MEDIAN 50TH              124.        152.          0.        47.1                   202.7       134.4
          75TH                                                  64.0
          90TH
SECONDARY CODE                                           11L 10L

                            11103L      12102L      19103L      09107L      17203L      16306L      26009L      26304L
                            SODIUM    MAGNESIUM   POTASSIUM    FLUORIDE    CHLORIDE    SULPHATE      IRON        IRON
                          DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED     TOTAL      EXTRBLE.

                     SUBM    NA          MG          K           F           CL          SO4         FE          FE
                      ID    MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)              4(0)        4(0)        4(0)        4(0)        4(0)        4(0)        1(0)        3(0)
           LOW               7.4         8.          1.20        .92         5.         60.         .10         .11
          HIGH              23.0        22.          2.4        1.40        45.00       120.         .10         .610
       AVERAGE              15.3        13.8         1.85       1.058       25.63        77.0                     .427
      STD.DEV.               7.8         6.0          .64        .229       18.18        28.9                     .275
  PERCNT:10TH
          25TH               8.7         9.6         1.30        .930       10.75        60.0
   MEDIAN 50TH              15.5        12.6         1.90        .955       26.25        63.9                     .56
          75TH              22.0        18.0         2.40       1.185       40.50        93.9
          90TH
SECONDARY CODE              11L         11L         11L         06L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  66                         NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                        INDUSTRIAL MONITORING
STATION 20AL05EB2701    LAT. 53D 34M 19S  LONG. 113D 21M  3S   PR 3   UTM 12 344350E 5938250N  FOR JUL 28, 1981 TO AUG 08, 1984
FIBERGLASS CANADA LTD EDMONTON           FINAL EFFLUENT COMP.
SE S17 T53 R23 W4M

                          07105L        07205L        07562L        07021L        07906L        07905L        15421L        97160S
                         NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN     PHOSPHORUS    DISCHARGE
                         DISSOLVED     DISSOLVED     DISSOLVED      TOTAL       PARTICULATE   PARTICULATE     TOTAL        INSTANT
                         NO3 & NO2     NITRITE       AMMONIA       KJELDAHL       TOTAL        (CALCD.)
                 SUBM       N             N             N             N             N             N             P
                  ID      MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          M3/S
SAMPLES(FLAGS)            4(0)          4(2)          3(0)          3(0)          2(0)                        3(0)
           LOW            .300          L.02          1.210         2.000          .070                        .094
          HIGH           2.75           1.00          2.200         5.9            .19                         .41
       AVERAGE           1.445           .480*        1.680         3.833          .130                        .281
      STD.DEV.           1.053           .518*         .497         1.960          .085                        .166
  PERCNT:10TH
          25TH            .640          L.035
   MEDIAN 50TH           1.365           .450*        1.63          3.600          .130                        .340
          75TH           2.250           .925
          90TH
SECONDARY CODE                                        61L           15L                                        19L

                          10474L        10407L        10511L        10453L        14101L        97160S        97163S
                          RESIDUE       RESIDUE       RESIDUE       RESIDUE       SILICA       DISCHARGE     DISCHARGE
                           TOTAL      NONFILTRABLE    VOLATILE     FILTRABLE     REACTIVE       INSTANT        DAILY
                                                     NONFILTR.                                                 MEAN
                 SUBM                                (CALCD.)                      SIO2
                  ID      MG/L          MG/L          MG/L          MG/L          MG/L          M3/S          CFS
SAMPLES(FLAGS)            4(0)          4(0)                        3(0)          4(0)                        4(0)
           LOW            253.0          15.0                       240.0          3.80                        .22
          HIGH            566.          106.                        460.           8.1                         .45
       AVERAGE            406.9          60.0                       383.3          6.30                        .3650
      STD.DEV.            138.6          49.2                       124.2          1.82                        .1008
  PERCNT:10TH
          25TH            295.9          17.5                                      5.05                        .3000
   MEDIAN 50TH            404.4          59.4                       450.           6.65                        .3950
          75TH            518.0         102.4                                      7.55                        .4300
          90TH
SECONDARY CODE            71L           01L                                       02L

                          00205L        02074L        06537L        06524L        02001L        16101L        10701L        06608L
                          TOTAL        TURBIDITY      PHENOLIC      OIL AND       ODOUR        SULPHIDE      SURFACT.       CYANIDE
                         DISSOLVED                    MATERIAL      GREASE       THRESHOLD     DISSOLVED     N-ALKYL
                          SOLIDS                                                  NUMBER                     SULPHNTS.
                 SUBM                                 PHENOL                                      S            LAS           CN
                  ID      MG/L          NTU           MG/L          MG/L          TON           MG/L          MG/L          MG/L
SAMPLES(FLAGS)            4(0)          4(0)          2(0)          2(0)          1(0)                        3(0)
           LOW            224.3          2.0           .005         2.900           1.                         .18
          HIGH            315.          35.0           .079         8.0             1.                         .55
       AVERAGE            264.8         13.8           .042         5.450                                      .307
      STD.DEV.             41.5         15.1           .052         3.606                                      .211
  PERCNT:10TH
          25TH            231.1          3.0
   MEDIAN 50TH            260.0          9.0           .042         5.450                                      .19
          75TH            298.5         24.5
          90TH
SECONDARY CODE                                                      21L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  67                     NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB2701    LAT. 53D 34M 19S  LONG. 113D 21M  3S   PR 3   UTM 12 344350E 5938250N  FOR JUL 28, 1981 TO AUG 08, 1984
FIBERGLASS CANADA LTD EDMONTON            FINAL EFFLUENT COMP.
SE S17 T53 R23 W4M

                       08304L        08202L       06107L        06154L         06001L       06051L        06006L        06905L
                       OXYGEN        OXYGEN       CARBON        CARBON         CARBON       CARBON        CARBON        CARBON
                         TOTAL       BIOCHEM.     DISSOLVED     DISSOLVED       TOTAL        TOTAL        TOTAL          PARTICULATE
                         COD         DEMAND-BOD   ORGANIC       INORGANIC       ORGANIC      INORGANIC                    TOTAL
               SUBM    02              O2           C             C              C            C             C             C
                ID     MG/L          MG/L         MG/L          MG/L           MG/L         MG/L          MG/L          MG/L
SAMPLES(FLAGS)           3(0)                       2(0)          2(0)          1(0)                                      2(0)
           LOW            2.0                        3.30         18.10          11.3                                       .91
          HIGH           17.7                        5.0          43.0           11.3                                      2.45
       AVERAGE           11.6                        4.15         30.55                                                    1.68
      STD.DEV.            8.4                        1.20         17.61                                                    1.09
   PERCNT:10TH
          25TH
    MEDIAN 50TH          15.2                        4.15         30.55                                                    1.68
          75TH
          90TH
SECONDARY CODE         01L                                                     07L

                       24101L        24009L       24302L        80015L         80011L       27009L        27302L        47304L
                       CHROMIUM      CHROMIUM     CHROMIUM      MERCURY        MERCURY      COBALT        COBALT        SILVER
                       HEXAVALENT    TOTAL         EXTRBLE.     TOTAL          TOTAL        TOTAL         EXTRBLE.      EXTRBLE.

               SUBM      CR            CR           CR          HG             HG             CO            CO            AG
                ID     MG/L          MG/L         MG/L          MG/L           UG/L         MG/L          MG/L          MG/L
SAMPLES(FLAGS)           3(3)          1(0)                       2(2)                        1(0)
           LOW         L.001            .019                    L.0001                          .007
          HIGH         L.01             .019                    L.0001                          .007
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
    MEDIAN 50TH        L.001                                    L.0001
          75TH
          90TH
SECONDARY CODE

                       29009L        29305L       28009L        28302L         48009L       48302L        82009L        82302L
                       COPPER        COPPER       NICKEL        NICKEL         CADMIUM      CADMIUM       LEAD          LEAD
                        TOTAL        EXTRBLE.     TOTAL         EXTRBLE.       TOTAL        EXTRBLE.      TOTAL         EXTRBLE.

               SUBM      CU            CU           NI            NI             CD           CD            PB            PB
                ID     MG/L          MG/L         MG/L          MG/L           MG/L         MG/L          MG/L          MG/L
SAMPLES(FLAGS)           1(0)                       1(0)                         1(0)                                     1(1)
           LOW            .022                       .020                         .004                                    L.003
          HIGH            .022                       .020                         .004                                    L.003
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
    MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
```

```
REQUEST 0010 -  0012 PAGE  68                          NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                        INDUSTRIAL MONITORING
STATION 20AL05EB2701    LAT. 53D 34M 19S  LONG. 113D 21M  3S   PR 3   UTM 12 344350E 5938250N  FOR AUG 08, 1984 TO AUG 08, 1984
FIBERGLASS CANADA LTD EDMONTON              FINAL EFFLUENT COMP.
SE S17 T53 R23 W4M

                          30009L       30305L       25003L       25304L       23009L       42304L       42009L       51003L
                           ZINC         ZINC       MANGANESE    MANGANESE    VANADIUM    MOLYBDENUM   MOLYBDENUM    ANTIMONY
                          TOTAL       EXTRBLE.      TOTAL       EXTRBLE.      TOTAL       EXTRBLE.      TOTAL        TOTAL

                 SUBM      ZN           ZN           MN           MN           V            MO           MO           SB
                  ID      MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)            1(0)                      1(0)                      1(0)                      1(0)
           LOW             .101                      .035                      .008                      .006
          HIGH             .101                      .035                      .008                      .006
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
    MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE

                          33005L       33104L       34005L       34102L       13111L       13306L       04102L       04304L
                          ARSENIC      ARSENIC     SELENIUM     SELENIUM     ALUMINUM     ALUMINUM    BERYLLIUM    BERYLLIUM
                         TOTAL        DISSOLVED    TOTAL        DISSOLVED    DISSOLVED     EXTRBLE.    DISSOLVED     EXTRBLE.

                 SUBM      AS           AS           SE           SE           AL           AL           BE           BE
                  ID      MG/L         MG/L         MG/L         MG/L         UG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)            1(0)                      1(1)                                   1(0)                      1(1)
           LOW            .0006                     L.0002                                  .500                     L.001
          HIGH            .0006                     L.0002                                  .500                     L.001
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
    MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  69                            NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                           INDUSTRIAL MONITORING
STATION 20AL05EB2800    LAT. 53D 34M 21S  LONG. 113D 21M 13S   PR 3   UTM 12 344150E 5938300N  FOR APR 11, 1984 TO JUN 05, 1984
ALBERTA PUBLIC WORKS RESEARCH             PILOT PLANT CLOVER BAR
EFFLUENT GRAB                             SE S17 T53 R23 W4M
                         02061F       10301L       10301F       10151L       10101L       02041L       97160S       97163S
                       TEMPERATURE      PH           PH       ALKALINITY   ALKALINITY    SPECIFIC    DISCHARGE    DISCHARGE
                        OF WATER                                 PHENOL       TOTAL      CONDUCT.     INSTANT        DAILY
                                                              PHTHALEIN                                              MEAN
                   SUBM                                         CACO3        CACO3
                    ID    DEG.C       PH UNITS     PH UNITS     MG/L         MG/L         US/CM        M3/S          CFS
SAMPLES(FLAGS)                          2(0)                     1(0)         2(0)         2(0)
           LOW                          7.00                       .0          49.6         281.
          HIGH                          7.90                       .0          69.4         284.
       AVERAGE                                                                 59.5         283.
      STD.DEV.                                                                 14.0           2.
   PERCNT:10TH
          25TH
   MEDIAN 50TH                          7.45                                   59.5         283.
          75TH
          90TH
SECONDARY CODE

                         06201L       06202L       06301L       20103L       20105L       10602L       10604L       97160S
                       BICARBONT.   BICARBONT.   CARBONATE     CALCIUM      CALCIUM     HARDNESS     HARDNESS     DISCHARGE
                        (CALCD.)     (CALCD.)     (CALCD.)    DISSOLVED    DISSOLVED      TOTAL        TOTAL       INSTANT
                                                                            (CALCD.)     (CALCD.)
                  SUBM    HCO3         HCO3          CO3          CA           CA          CACO3        CACO3
                   ID   MG/L          MG/L          MG/L         MG/L         MG/L         MG/L         MG/L         M3/S
SAMPLES(FLAGS)            1(0)         2(0)         1(0)         2(0)         1(0)         2(0)
           LOW             85.          60.           0.         24.0         20.7         97.0
          HIGH             85.          85.           0.         25.0         20.7        107.7
       AVERAGE                          73.                      24.5                      102.3
      STD.DEV.                          17.                        .7                        7.6
   PERCNT:10TH
          25TH
   MEDIAN 50TH                          73.                      24.5                      102.3
          75TH
          90TH
SECONDARY CODE                                                  10L
                         11103L       12102L       19103L       09107L       17203L       16306L       26009L       26304L
                         SODIUM     MAGNESIUM    POTASSIUM     FLUORIDE     CHLORIDE     SULPHATE       IRON         IRON
                       DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED      TOTAL       EXTRBLE.

                  SUBM    NA           MG            K            F            CL           SO4          FE           FE
                   ID    MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)           2(0)         2(0)         2(0)         2(0)         2(0)         2(0)                      2(0)
           LOW            6.0          9.0         1.70         .940         6.00         52.0                      .080
          HIGH            7.0         11.0         2.50        1.010         7.00         67.0                      .160
       AVERAGE            6.5         10.0         2.10         .975         6.50         59.5                      .120
      STD.DEV.             .7          1.4          .57         .049          .71         10.6                      .057
   PERCNT:10TH
          25TH
   MEDIAN 50TH            6.5         10.0         2.10         .975         6.50         59.5                      .120
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  70                            NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                           INDUSTRIAL MONITORING
STATION 20AL05EB2800    LAT. 53D 34M 21S  LONG. 113D 21M 13S   PR 3   UTM 12 344150E 5938300N  FOR APR 11, 1984 TO JUN 05, 1984
ALBERTA PUBLIC WORKS RESEARCH             PILOT PLANT CLOVER BAR
EFFLUENT GRAB                             SE S17 T53 R23 W4M

                          07105L        07205L        07562L        07021L        07906L        07905L        15421L        97160S
                         NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN     PHOSPHORUS     DISCHARGE
                         DISSOLVED     DISSOLVED     DISSOLVED       TOTAL      PARTICULATE   PARTICULATE      TOTAL        INSTANT
                         NO3 & NO2     NITRITE       AMMONIA       KJELDAHL       TOTAL        (CALCD.)
                  SUBM       N            N             N             N             N             N             P
                   ID      MG/L         MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)             2(0)         2(1)          2(0)          2(0)          2(0)                        2(0)          M3/S
           LOW             .130        L.050         1.300         2.900          .160                         .310
          HIGH             .250         .170         2.150         6.600          .410                         .430
       AVERAGE             .190         .110*        1.725         4.750          .285                         .370
      STD.DEV.             .085         .085*         .601         2.616          .177                         .085
   PERCNT:10TH
          25TH
    MEDIAN 50TH            .190         .110*        1.725         4.750          .285                         .370
          75TH
          90TH
SECONDARY CODE

                          10474L        10407L        10511L        10453L        14101L        97160S        97163S
                         RESIDUE       RESIDUE       RESIDUE       RESIDUE        SILICA       DISCHARGE     DISCHARGE
                          TOTAL      NONFILTRABLE    VOLATILE     FILTRABLE      REACTIVE       INSTANT        DAILY
                                                    NONFILTR.                                                  MEAN
                  SUBM                              (CALCD.)                       SIO2
                   ID     MG/L          MG/L          MG/L          MG/L           MG/L          M3/S           CFS
SAMPLES(FLAGS)            1(0)          2(0)                        1(0)           2(0)
           LOW            243.0          3.0                        240.0           3.30
          HIGH            243.0         49.2                        240.0           3.50
       AVERAGE                          26.1                                        3.40
      STD.DEV.                          32.7                                         .14
   PERCNT:10TH
          25TH
    MEDIAN 50TH                         26.1                                        3.40
          75TH
          90TH
SECONDARY CODE                                                                     02L

                          00205L        02074L        06537L        06524L        02001L        16101L        10701L        06608L
                          TOTAL       TURBIDITY      PHENOLIC      OIL AND        ODOUR        SULPHIDE      SURFACT.       CYANIDE
                         DISSOLVED                   MATERIAL      GREASE       THRESHOLD     DISSOLVED     N-ALKYL
                          SOLIDS                                                  NUMBER                    SULPHNTS.
                  SUBM                               PHENOL                                       S            LAS           CN
                   ID     MG/L          NTU           MG/L          MG/L           TON           MG/L          MG/L          MG/L
SAMPLES(FLAGS)            2(0)                        2(0)          1(0)
           LOW            142.7                        .008          .900
          HIGH            148.6                        .011          .900
       AVERAGE            145.7                        .010
      STD.DEV.              4.2                        .002
   PERCNT:10TH
          25TH
    MEDIAN 50TH           145.7                        .010
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  71                       NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                      INDUSTRIAL MONITORING
STATION 20AL05EB2800     LAT. 53D 34M 21S  LONG. 113D 21M 13S   PR 3   UTM 12 344150E 5938300N  FOR APR 11, 1984 TO JUN 05, 1984
ALBERTA PUBLIC WORKS RESEARCH             PILOT PLANT CLOVER BAR
EFFLUENT GRAB                             SE S17 T53 R23 W4M

                         08304L        08202L        06107L        06154L        06001L        06051L        06006L        06905L
                         OXYGEN        OXYGEN        CARBON        CARBON        CARBON        CARBON        CARBON        CARBON
                          TOTAL       BIOCHEM.     DISSOLVED     DISSOLVED        TOTAL         TOTAL       TOTAL       PARTICULATE
                            COD      DEMAND-BOD     ORGANIC      INORGANIC       ORGANIC      INORGANIC                    TOTAL
                 SUBM       02            02           C             C             C             C             C            C
                  ID      MG/L          MG/L         MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)             2(0)                       2(0)          2(0)                                                    2(0)
           LOW             20.5                       4.20         12.80                                                    1.82
          HIGH             21.6                       6.20         16.20                                                    4.86
       AVERAGE             21.0                       5.20         14.50                                                    3.34
      STD.DEV.               .8                       1.41          2.40                                                    2.15
  PERCNT:10TH
          25TH
   MEDIAN 50TH             21.0                       5.20         14.50                                                    3.34
          75TH
          90TH
SECONDARY CODE

                         24101L        24009L        24302L        80015L        80011L        27009L        27302L        47304L
                        CHROMIUM      CHROMIUM      CHROMIUM      MERCURY       MERCURY       COBALT        COBALT        SILVER
                       HEXAVALENT      TOTAL        EXTRBLE.       TOTAL         TOTAL         TOTAL        EXTRBLE.      EXTRBLE.

                 SUBM     CR            CR            CR            HG            HG            CO            CO            AG
                  ID     MG/L          MG/L          MG/L          MG/L          UG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)           1(1)          2(1)                        2(1)                        2(2)
           LOW           L.001         L.001                      L.0001                       L.001
          HIGH           L.001          .008                       .0002                       L.001
       AVERAGE                          .004*                      .0001*
      STD.DEV.                          .005*                      .0001*
  PERCNT:10TH
          25TH
   MEDIAN 50TH                          .004*                      .0001*                      L.001
          75TH
          90TH
SECONDARY CODE

                         29009L        29305L        28009L        28302L        48009L  .     48302L        82009L        82302L
                         COPPER        COPPER        NICKEL        NICKEL        CADMIUM       CADMIUM        LEAD          LEAD
                          TOTAL       EXTRBLE.       TOTAL        EXTRBLE.       TOTAL        EXTRBLE.       TOTAL        EXTRBLE.

                 SUBM     CU            CU            NI            NI            CD            CD            PB            PB
                  ID     MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)           2(0)                        2(0)                        2(2)                                      2(0)
           LOW            .007                        .005                       L.001                                      .008
          HIGH            .012                        .008                       L.001                                      .011
       AVERAGE            .010                        .007                                                                  .010
      STD.DEV.            .004                        .002                                                                  .002
  PERCNT:10TH
          25TH
   MEDIAN 50TH            .010                        .007                       L.001                                      .010
          75TH
          90TH
SECONDARY CODE
```

```
REQUEST 0010 -  0012 PAGE  72                        NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                       INDUSTRIAL MONITORING
STATION 20AL05EB2800    LAT. 53D 34M 21S  LONG. 113D 21M 13S   PR 3   UTM 12 344150E 5938300N  FOR APR 11, 1984 TO JUN 05, 1984
ALBERTA PUBLIC WORKS RESEARCH             PILOT PLANT CLOVER BAR
EFFLUENT GRAB                             SE S17 T53 R23 W4M

                       30009L      30305L      25003L      25304L      23009L      42304L      42009L      51003L
                        ZINC        ZINC     MANGANESE   MANGANESE    VANADIUM   MOLYBDENUM  MOLYBDENUM   ANTIMONY
                       TOTAL     EXTRBLE.      TOTAL     EXTRBLE.      TOTAL     EXTRBLE.      TOTAL       TOTAL

                SUBM    ZN          ZN          MN          MN          V           MO          MO          SB
                 ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)          2(0)                    2(1)                    2(1)                    2(1)
           LOW           .020                   L.008                   L.002                   L.001
          HIGH           .022                    .010                    .003                    .007
       AVERAGE           .021                    .009*                   .002*                   .004*
      STD.DEV.           .001                    .001*                   .001*                   .004*
  PERCNT:10TH
          25TH
   MEDIAN 50TH           .021                    .009*                   .002*                   .004*
          75TH
          90TH
SECONDARY CODE

                       33005L      33104L      34005L      34102L      13111L      13306L      04102L      04304L
                       ARSENIC     ARSENIC     SELENIUM    SELENIUM    ALUMINUM    ALUMINUM   BERYLLIUM   BERYLLIUM
                       TOTAL      DISSOLVED    TOTAL      DISSOLVED   DISSOLVED    EXTRBLE.   DISSOLVED    EXTRBLE.

                SUBM    AS          AS          SE          SE          AL          AL          BE          BE
                 ID     MG/L        MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)          2(0)                    2(2)                                2(0)                    2(2)
           LOW          .0006                   L.0002                               .307                   L.001
          HIGH          .0006                   L.0002                              1.110                   L.001
       AVERAGE          .0006                                                        .709
      STD.DEV.          .0000                                                        .566
  PERCNT:10TH
          25TH
   MEDIAN 50TH          .0006                   L.0002                               .709                   L.001
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  73                          NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                          INDUSTRIAL MONITORING
STATION 20AL05EB3000    LAT. 53D 34M 47S  LONG. 113D 21M 50S   PR 3   UTM 12 343500E 5939150N  FOR APR 29, 1980 TO JUL 26, 1984
CELANESE CANADA LTD EDMONTON              SOUTH FLUME GRAB
S17 T53 R23 W4M

                          02061F        10301L       10301F        10151L       10101L       02041L       97160S       97163S
                       TEMPERATURE        PH           PH        ALKALINITY   ALKALINITY    SPECIFIC    DISCHARGE    DISCHAREE
                        OF WATER                                   PHENOL        TOTAL      CONDUCT.     INSTANT       DAILY
                   SUBM                                          PHTHALEIN                                             MEAN
                    ID                                             CACO3        CACO3
                         DEG.C        PH UNITS      PH UNITS       MG/L         MG/L          US/CM        M3/S          CFS
SAMPLES(FLAGS)            11(0)        16(0)         2(0)         15(2)        16(0)         16(0)                     16(0)
           LOW              8.6          7.2          7.6            .0          72.          406.                       .41
          HIGH             34.0          8.5          7.8           5.8         155.         1560.                      9.2
       AVERAGE             23.0                                      .7*        130.9          611.                      5.6275
      STD.DEV.              8.1                                     1.8*         22.0          300.                      2.4306
  PERCNT:10TH              14.0          7.3                         .0         109.           406.                      2.13
          25TH             17.0          7.50                        .0         117.6          445.                      4.3850
   MEDIAN 50TH             24.0          7.75         7.70           .0         132.0          515.                      6.2600
          75TH             31.0          8.00                        .0         149.0          606.                      7.3350
          90TH             34.0          8.5                        L4.         155.          1079.                      8.1
SECONDARY CODE

                          06201L        06202L       06301L        20103L       20105L       10602L       10604L       97160S
                        BICARBONT.    BICARBONT.    CARBONATE      CALCIUM      CALCIUM     HARDNESS     HARDNESS     DISCHARGE
                         (CALCD.)      (CALCD.)     (CALCD.)      DISSOLVED    DISSOLVED      TOTAL        TOTAL       INSTANT
                                                                                (CALCD.)     (CALCD.)
                   SUBM    HCO3          HCO3          CO3            CA           CA         CACO3        CACO3
                    ID   MG/L            MG/L          MG/L          MG/L         MG/L         MG/L         MG/L         M3/S
SAMPLES(FLAGS)            15(2)          5(0)         15(2)        15(0)         2(0)        11(0)         6(0)
           LOW              88.          138.           0.          35.0         41.8        147.7        154.
          HIGH             189.          162.           7.          71.0         54.1        250.6        232.0
       AVERAGE             158.*         154.           1.*         53.1         47.9        191.9        197.8
      STD.DEV.              27.*          10.           2.*         10.5          8.7         31.7         26.2
  PERCNT:10TH              133.                         0.          41.0                     163.4
          25TH             138.          155.           0.          46.                      168.4        191.7
   MEDIAN 50TH             160.          156.           0.          49.2         47.9        185.7        197.2
          75TH             179.          160.           0.          61.0                     214.2        215.0
          90TH             185.                        Q5.          67.                      237.3
SECONDARY CODE                                                11L 10L

                          11103L        12102L       19103L        09107L       17203L       16306L       26009L       26304L
                          SODIUM      MAGNESIUM     POTASSIUM     FLUORIDE     CHLORIDE     SULPHATE       IRON         IRON
                        DISSOLVED     DISSOLVED     DISSOLVED     DISSOLVED    DISSOLVED    DISSOLVED      TOTAL       EXTRBLE.

                   SUBM    NA            MG            K             F            CL           SO4           FE           FE
                    ID    MG/L          MG/L          MG/L          MG/L         MG/L         MG/L          MG/L         MG/L
SAMPLES(FLAGS)            16(0)         16(0)         16(0)         16(0)        14(0)        16(0)          4(0)        11(0)
           LOW              18.          11.0          1.1           .16         11.           51.9          .17          .130
          HIGH             207.          31.0          3.85          .54        340.          363.0         2.24         1.39
       AVERAGE              46.7         15.3          2.15          .297        48.40        106.2         1.232         .325
      STD.DEV.              51.4          4.8           .81          .107        85.55         73.8         1.159         .364
  PERCNT:10TH               18.          12.           1.3           .18         13.           63.0                       .14
          25TH              20.5         12.0          1.40          .225        13.00         74.5          .230         .15
   MEDIAN 50TH              26.8         13.5          2.05          .265        22.00         81.5         1.260         .17
          75TH              44.0         16.8          2.80          .355        32.20        114.0         2.235         .35
          90TH             136.0         19.0          3.2           .50         67.6         160.                        .35
SECONDARY CODE            11L           11L           11L       06L 05L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  74                        NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                       INDUSTRIAL MONITORING
STATION 20AL05EB3000    LAT. 53D 34M 47S  LONG. 113D 21M 50S   PR 3   UTM 12 343500E 5939150N  FOR APR 29, 1980 TO JUL 26, 1984
CELANESE CANADA LTD EDMONTON               SOUTH FLUME GRAB
S17 T53 R23 W4M

                        07105L       07205L       07562L       07021L       07906L       07905L       15421L       97160S
                        NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN     PHOSPHORUS   DISCHARGE
                        DISSOLVED    DISSOLVED    DISSOLVED    TOTAL        PARTICULATE  PARTICULATE  TOTAL        INSTANT
                        NO3 & NO2    NITRITE      AMMONIA      KJELDAHL     TOTAL        (CALCD.)
                  SUBM  N            N            N            N            N            N            P
                  ID    MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         M3/S
SAMPLES(FLAGS)          16(2)        15(10)       14(0)        15(0)        10(2)                     15(0)
           LOW          L.05         L.02         .03          .60          L.01                      .13
          HIGH          1.10         .29          2.470        4.000        2.04                      .550
       AVERAGE          .400*        .064*        .445         1.707        .432*                     .242
      STD.DEV.          .334*        .063*        .608         1.180        .608*                     .118
  PERCNT:10TH           L.05         .035         .10          .700         L.010                     .130
          25TH          .150         L.05         .160         .800         .090                      .155
   MEDIAN 50TH          .285         L.05         .303         1.310        .215                      .207
          75TH          .610         .05          .41          2.500        .52                       .330
          90TH          1.00         .07          .62          3.86         1.370                     .400
SECONDARY CODE          10L          06L          61L          15L                                    19L 06L

                        10474L       10407L       10511L       10453L       14101L       97160S       97163S
                        RESIDUE      RESIDUE      RESIDUE      RESIDUE      SILICA       DISCHARGE    DISCHARGE
                        TOTAL        NONFILTRABLE VOLATILE     FILTRABLE    REACTIVE     INSTANT      DAILY
                                                  NONFILTR.                                           MEAN
                  SUBM                            (CALCD.)                  SIO2
                  ID    MG/L         MG/L         MG/L         MG/L         MG/L         M3/S         CFS
SAMPLES(FLAGS)          15(0)        16(0)        2(0)         10(0)        16(0)                     16(0)
           LOW          326.         26.          55.0         300.         2.9                       .41
          HIGH          1079.        349.         106.0        730.         6.70                      9.2
       AVERAGE          541.3        109.0        80.5         463.0        4.58                      5.6275
      STD.DEV.          191.7        87.3         36.1         148.5        .96                       2.4306
  PERCNT:10TH           378.         28.                       315.0        3.40                      2.13
          25TH          412.         47.5                      340.         4.10                      4.3850
   MEDIAN 50TH          478.         75.5         80.5         430.0        4.60                      6.2600
          75TH          608.         165.0                     520.         4.85                      7.3350
          90TH          800.         219.                      715.0        5.9                       8.1
SECONDARY CODE          71L          01L                       51L          02L

                        00205L       02074L       06537L       06524L       02001L       16101L       10701L       06608L
                        TOTAL        TURBIDITY    PHENOLIC     OIL AND      ODOUR        SULPHIDE     SURFACT.     CYANIDE
                        DISSOLVED                 MATERIAL     GREASE       THRESHOLD    DISSOLVED    N-ALKYL
                        SOLIDS                                              NUMBER                    SULPHNTS.
                  SUBM                            PHENOL                                 S            LAS          CN
                  ID    MG/L         NTU          MG/L         MG/L         TON          MG/L         MG/L         MG/L
SAMPLES(FLAGS)          15(0)        14(0)        16(0)        16(3)        14(0)                     12(0)        3(0)
           LOW          218.7        12.0         .010         L.2          1.                        .07          .003
          HIGH          813.         380.0        .90          12.0         100.                      1.63         .109
       AVERAGE          340.4        84.2         .104         2.137*       18.                       .386         .0437
      STD.DEV.          142.8        100.3        .216         3.064*       35.                       .483         .0571
  PERCNT:10TH           230.         15.0         .010         L.2          1.                        .08
          25TH          246.         30.0         .025         .400         1.                        .080
   MEDIAN 50TH          318.         48.0         .041         .850         2.                        .145         .019
          75TH          370.0        82.0         .088         3.150        10.                       .530
          90TH          401.0        200.0        .140         5.0          100.                      .98
SECONDARY CODE                       73L                       21L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  75                          NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                        INDUSTRIAL MONITORING
STATION 20AL05EB3000    LAT. 53D 34M 47S  LONG. 113D 21M 50S   PR 3   UTM 12 343500E 5939150N  FOR APR 29, 1980 TO JUL 26, 1984
CELANESE CANADA LTD EDMONTON                 SOUTH FLUME GRAB
S17 T53 R23 W4M

                      08304L      08202L      06107L      06154L      06001L      06051L      06006L      06905L
                      OXYGEN      OXYGEN      CARBON      CARBON      CARBON      CARBON      CARBON      CARBON
                       TOTAL     BIOCHEM.   DISSOLVED   DISSOLVED     TOTAL       TOTAL     TOTAL     PARTICULATE
                        COD     DEMAND-BOD   ORGANIC    INORGANIC    ORGANIC   INORGANIC                 TOTAL
               SUBM     02          02          C           C           C           C           C           C
                ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)         16(0)       15(3)       10(0)       10(0)        6(0)        1(0)        1(0)       10(0)
           LOW          17.2        2.50        3.30       23.           1.8       18.         26.           .97
          HIGH          63.7       21.7        94.0        37.0         25.0       18.         26.         33.82
       AVERAGE          30.0        8.50*      16.24       31.30        13.53                              9.20
      STD.DEV.          12.9        5.12*      27.56        4.29         8.69                             10.94
  PERCNT:10TH           17.6        3.5         3.65       25.10                                           1.13
          25TH          19.9       L5.0         4.4        28.           8.                                1.74
   MEDIAN 50TH          25.5        7.5         7.50       32.50        13.65                              5.45
          75TH          37.5       10.5        12.         34.3         19.1                               8.49
          90TH          47.6       16.0        54.00       36.00                                          28.91
SECONDARY CODE         01L                                         07L 05L

                      24101L      24009L      24302L      80015L      80011L      27009L      27302L      47304L
                     CHROMIUM    CHROMIUM    CHROMIUM    MERCURY     MERCURY     COBALT      COBALT      SILVER
                    HEXAVALENT    TOTAL      EXTRBLE.     TOTAL       TOTAL       TOTAL      EXTRBLE.    EXTRBLE.

               SUBM     CR          CR          CR          HG          HG          CO          CO          AG
                ID     MG/L        MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)         15(0)       15(0)        1(0)       14(12)       2(2)       15(12)       1(1)        4(4)
           LOW          .008        .031        .08       L.0001       L.02        L.001       L.001       L.02
          HIGH          .225        .293        .08        .0005       L.02        L.01        L.001       L.02
       AVERAGE          .085        .105                   .0001*                   .004*
      STD.DEV.          .075        .087                   .0001*                   .004*
  PERCNT:10TH           .02         .036                  L.0001                   L.001
          25TH          .033        .048                  L.0001                   L.001                   L.020
   MEDIAN 50TH          .06         .062                  L.0001       L.020       L.001                   L.020
          75TH          .100        .14                   L.0001                   L.01                    L.020
          90TH          .225        .250                   .0003                   L.01
SECONDARY CODE

                      29009L      29305L      28009L      28302L      48009L      48302L      82009L      82302L
                      COPPER      COPPER      NICKEL      NICKEL      CADMIUM     CADMIUM      LEAD        LEAD
                       TOTAL     EXTRBLE.     TOTAL      EXTRBLE.     TOTAL      EXTRBLE.     TOTAL      EXTRBLE.

               SUBM     CU          CU          NI          NI          CD          CD          PB          PB
                ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)         15(0)        1(0)       15(3)        1(0)       14(10)       1(1)        5(3)       11(9)
           LOW          .009        .028        .005        .006       L.001       L.001       L.003       L.002
          HIGH          .14         .028        .022        .006       L.01        L.001        .010       L.02
       AVERAGE          .029                    .013*                   .004*                   .005*       .010*
      STD.DEV.          .032                    .005*                   .004*                   .003*       .008*
  PERCNT:10TH           .010                    .008                   L.001                               L.003
          25TH          .013                    .009                   L.001                   L.003       L.003
   MEDIAN 50TH          .018                    .012                    .002                   L.003        .006
          75TH          .031                   L.02                    L.01                     .006       L.02
          90TH          .048                    .020                   L.01                                L.02
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0010 -  0012 PAGE  76                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                  INDUSTRIAL MONITORING
STATION 20AL05EP3000    LAT. 53D 34M 47S  LONG. 113D 21M 50S   PR 3   UTM 12 343500E 5939150N  FOR APR 29, 1980 TO JUL 26, 1984
CELANESE CANADA LTD EDMONTON                 SOUTH FLUME GRAB
S17 T53 R23 W4M

                          30009L      30305L      25003L      25304L      23009L      42304L      42009L      51003L
                           ZINC        ZINC      MANGANESE   MANGANESE   VANADIUM   MOLYBDENUM  MOLYBDENUM   ANTIMONY
                          TOTAL      EXTRBLE.     TOTAL      EXTRBLE.     TOTAL      EXTRBLE.     TOTAL       TOTAL

                  SUBM     ZN          ZN          MN          MN           V          MO          MO          SB
                   ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            13(0)       1(0)        15(0)        1(0)       14(6)                   13(9)        3(2)
           LOW             .025        .048        .024         .17       L.002                   L.001       L.001
          HIGH             .297        .048        .286         .17       L.01                    L.02         .0012
       AVERAGE             .093                    .077                    .006*                   .008*       .0011*
      STD.DEV.             .073                    .064                    .003*                   .009*       .0001*
  PERCNT:10TH              .040                    .029                   L.002                   L.001
          25TH             .041                    .037                    .004                   L.001
   MEDIAN 50TH             .07                     .067                    .007                    .004       L.001
          75TH             .120                    .087                   L.01                    L.02
          90TH             .136                    .127                   L.01                    L.02
SECONDARY CODE                                                           02L

                          33005L      33104L      34005L      34102L      13111L      13306L      04102L      04304L
                          ARSENIC     ARSENIC     SELENIUM    SELENIUM    ALUMINUM    ALUMINUM    BERYLLIUM   BERYLLIUM
                          TOTAL      DISSOLVED    TOTAL      DISSOLVED   DISSOLVED    EXTRBLE.   DISSOLVED    EXTRBLE.

                  SUBM     AS          AS          SE          SE          AL          AL          BE          BE
                   ID     MG/L        MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            9(2)        1(0)        8(6)        1(1)         3(0)       10(0)        3(3)       10(10)
           LOW            .0003       .0010       L.0002      L.0002      950.          .352      L.005       L.001
          HIGH            .0025       .0010        .0048      L.0002      1450.        2.580      L.005       L.003
       AVERAGE            .0011*                   .0011*                 1123.33       .917
      STD.DEV.            .0008*                   .0016*                  283.08       .658
  PERCNT:10TH                                                                           .426                  L.001
          25TH            .0006                   L.0002                                .525                  L.001
   MEDIAN 50TH            .0007                   L.0006                   970.         .699      L.005       L.001
          75TH            L.001                    .0013*                              1.020                  L.001
          90TH                                                                         2.000                  L.002
SECONDARY CODE                                    07L                                 02L                    02L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  77                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                  INDUSTRIAL MONITORING
STATION 20AL05EB3001    LAT. 53D 34M 47S  LONG. 113D 21M 50S   PR 3   UTM 12 343500E 5939150N  FOR MAR 11, 1981 TO JUL 25, 1984
CELANESE CANADA LTD EDMONTON              SOUTH FLUME COMP.
S17 T53 R23 W4M

                        02061F        10301L        10301F        10151L        10101L        02041L        97160S        97163S
                      TEMPERATURE       PH            PH        ALKALINITY    ALKALINITY    SPECIFIC     DISCHARGE     DISCHARGE
                       OF WATER                                   PHENOL        TOTAL       CONDUCT.      INSTANT        DAILY
                                                                PHTHALEIN                                                 MEAN
                SUBM                                              CACO3         CACO3
                 ID     DEG.C        PH UNITS      PH UNITS       MG/L          MG/L         US/CM          M3/S          CFS
SAMPLES(FLAGS)           1(0)          3(0)          1(0)          2(1)          3(0)         3(0)                       4(0)
           LOW           25.5          7.6           7.9            .0          144.0         521.                        2.13
          HIGH           25.5          7.70          7.9           L.1          155.0         666.                        7.9
       AVERAGE                                                     .0*          148.0         612.                        5.4650
      STD.DEV.                                                     .1*            6.1          80.                        2.4419
   PERCNT:10TH
          25TH                                                                                                            3.7900
  MEDIAN  50TH                         7.62                        .0*          145.1         650.                        5.9150
          75TH                                                                                                            7.1400
          90TH
SECONDARY CODE

                        06201L        06202L        06301L        20103L        20105L        10602L        10604L        97160S
                      BICARBONT.    BICARBONT.    CARBONATE     CALCIUM       CALCIUM       HARDNESS      HARDNESS     DISCHARGE
                       (CALCD.)      (CALCD.)      (CALCD.)     DISSOLVED     DISSOLVED      TOTAL         TOTAL        INSTANT
                                                                              (CALCD.)      (CALCD.)
                SUBM    HCO3          HCO3          CO3           CA            CA           CACO3         CACO3
                 ID     MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          M3/S
SAMPLES(FLAGS)           2(1)          2(0)          2(1)          3(0)          1(0)          2(0)          2(0)
           LOW          Q175.          176.           0.           46.0          45.8         168.4         168.0
          HIGH           189.          177.          Q0.           68.0          45.8         232.0         197.0
       AVERAGE           182.*         176.           0.*          53.7                       200.2         182.5
      STD.DEV.            10.*           1.           0.*          12.4                        45.0          20.5
   PERCNT:10TH
          25TH
  MEDIAN  50TH           182.          176.           0.           47.0                       200.2         182.5
          75TH
          90TH
SECONDARY CODE                                             11L 10L

                        11103L        12102L        19103L        09107L        17203L        16306L        26009L        26304L
                        SODIUM       MAGNESIUM     POTASSIUM     FLUORIDE      CHLORIDE      SULPHATE        IRON          IRON
                       DISSOLVED     DISSOLVED     DISSOLVED     DISSOLVED     DISSOLVED     DISSOLVED       TOTAL        EXTRBLE.

                SUBM     NA            MG            K             F             CL            SO4            FE            FE
                 ID     MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)           3(0)          3(0)          3(0)          3(0)          3(0)          3(0)          1(0)          1(0)
           LOW           43.0          13.0          1.30           .19          29.30          68.0          1.64           .190
          HIGH           48.0          19.0          3.19           .28          46.0          137.0          1.64           .190
       AVERAGE           45.2          15.7          2.53           .237         37.77          99.0
      STD.DEV.            2.6           3.0          1.07           .045          8.35          35.0
   PERCNT:10TH
          25TH
  MEDIAN  50TH           44.5          15.1          3.1            .240         38.00          92.0
          75TH
          90TH
SECONDARY CODE          11L           11L           11L         06L 05L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  78                        NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                      INDUSTRIAL MONITORING
STATION 20AL05EB3001    LAT. 53D 34M 47S  LONG. 113D 21M 50S   PR 3   UTM 12 343500E 5939150N  FOR MAR 11, 1981 TO JUL 25, 1984
CELANESE CANADA LTD EDMONTON                      SOUTH FLUME COMP.
S17 T53 R23 W4M

                            07105L        07205L        07562L        07021L        07906L        07905L        15421L        97160S
                            NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN      PHOSPHORUS    DISCHARGE
                            DISSOLVED     DISSOLVED     DISSOLVED     TOTAL         PARTICULATE   PARTICULATE   TOTAL         INSTANT
                            NO3 & NO2     NITRITE       AMMONIA       KJELDAHL      TOTAL         (CALCD.)
                      SUBM  N             N             N             N             N             N             P
                        ID  MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          M3/S
      SAMPLES(FLAGS)        3(1)          3(1)          2(0)          3(0)          1(0)                        3(0)
                 LOW        L.050         .013          .005          .20           .510                        .156
                HIGH        1.00          .05           .10           .86           .510                        .260
             AVERAGE        .420*         .038*         .053          .573                                      .205
            STD.DEV.        .509*         .021*         .067          .338                                      .052
         PERCNT:10TH
                25TH
         MEDIAN 50TH        .210          L.050         .053          .660                                      .20
                75TH
                90TH
      SECONDARY CODE        10L           06L           61L           15L                                       19L 06L
                            10474L        10407L        10511L        10453L        14101L        97160S        97163S
                            RESIDUE       RESIDUE       RESIDUE       RESIDUE       SILICA        DISCHARGE     DISCHARGE
                            TOTAL         NONFILTRABLE  VOLATILE      FILTRABLE     REACTIVE      INSTANT       DAILY
                                                        NONFILTR.                                               MEAN
                      SUBM                              (CALCD.)                    SIO2
                        ID  MG/L          MG/L          MG/L          MG/L          MG/L          M3/S          CFS
      SAMPLES(FLAGS)        4(0)          4(0)          1(0)          2(0)          3(0)                        4(0)
                 LOW        420.          15.           11.0          390.          2.80                        2.13
                HIGH        590.0         160.0         11.0          410.0         6.30                        7.9
             AVERAGE        477.3         64.5                        400.0         4.53                        5.4650
            STD.DEV.        77.5          65.8                        14.1          1.75                        2.4419
         PERCNT:10TH
                25TH        427.0         21.5                                                                  3.7900
         MEDIAN 50TH        449.5         41.5                        400.0         4.5                         5.9150
                75TH        527.5         107.5                                                                 7.1400
                90TH
      SECONDARY CODE        71L           01L                         51L           02L
                            00205L        02074L        06537L        06524L        02001L        16101L        10701L        06608L
                            TOTAL         TURBIDITY     PHENOLIC      OIL AND       ODOUR         SULPHIDE      SURFACT.      CYANIDE
                            DISSOLVED                   MATERIAL      GREASE        THRESHOLD     DISSOLVED     N-ALKYL
                            SOLIDS                                                  NUMBER                      SULPHNTS.
                      SUBM                              PHENOL                                    S             LAS           CN
                        ID  MG/L          NTU           MG/L          MG/L          TON           MG/L          MG/L          MG/L
      SAMPLES(FLAGS)        2(0)          4(0)          3(0)          3(0)          3(0)                        3(1)
                 LOW        296.5         16.0          .006          1.2           1.                          L.01
                HIGH        445.0         74.0          .042          7.0           4.                          .10
             AVERAGE        370.7         37.0          .020          3.533         2.                          .040*
            STD.DEV.        105.0         25.9          .020          3.062         2.                          .052*
         PERCNT:10TH
                25TH                      19.5
         MEDIAN 50TH        370.7         29.0          .011          2.400         2.                          .01
                75TH                      54.5
                90TH
      SECONDARY CODE                                                  21L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  79                  NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                INDUSTRIAL MONITORING
STATION 20AL05EB3001    LAT. 53D 34M 47S  LONG. 113D 21M 50S   PR 3   UTM 12 343500E 5939150N  FOR MAR 11, 1981 TO JUL 25, 1984
CELANESE CANADA LTD EDMONTON                SOUTH FLUME COMP.
S17 T53 R23 W4M

                      08304L       08202L        06107L       06154L        06001L        06051L       06006L       06905L
                      OXYGEN       OXYGEN        CARBON       CARBON        CARBON        CARBON       CARBON       CARBON
                       TOTAL       BIOCHEM.     DISSOLVED    DISSOLVED      TOTAL         TOTAL       TOTAL       PARTICULATE
                        COD       DEMAND-BOD    ORGANIC      INORGANIC     ORGANIC      INORGANIC                   TOTAL
               SUBM     02            02           C            C             C             C            C           C
                ID     MG/L         MG/L         MG/L         MG/L          MG/L          MG/L         MG/L         MG/L
SAMPLES(FLAGS)          3(0)         3(2)         1(0)         1(0)          2(0)                                    1(0)
           LOW          45.0         L5.0         10.50        36.30         10.0                                     6.16
          HIGH          57.6         14.00        10.50        36.30         18.8                                     6.16
       AVERAGE          50.9          8.00*                                  14.40
      STD.DEV.           6.3          5.20*                                   6.22
   PERCNT:10TH
          25TH
   MEDIAN 50TH          50.          L5.                                     14.40
          75TH
          90TH
SECONDARY CODE        01L                                                 07L 05L

                      24101L       24009L        24302L       80015L        80011L        27009L       27302L       47304L
                     CHROMIUM     CHROMIUM      CHROMIUM      MERCURY       MERCURY       COBALT       COBALT       SILVER
                    HEXAVALENT     TOTAL         EXTRBLE.     TOTAL         TOTAL         TOTAL        EXTRBLE.     EXTRBLE.

               SUBM   CR           CR            CR           HG            HG            CO           CO           AG
                ID    MG/L         MG/L          MG/L         MG/L          UG/L          MG/L         MG/L         MG/L
SAMPLES(FLAGS)        4(1)         2(0)          1(0)         2(1)          1(1)          2(2)         1(1)         1(1)
           LOW        L.01         .028           .05         L.0001        L.000         L.001        L.001        L.02
          HIGH         .063        .150           .05          .0001        L.000         L.01         L.001        L.02
       AVERAGE         .037*       .089                        .0001*
      STD.DEV.         .029*       .086                        .0000*
   PERCNT:10TH
          25TH         .012*
   MEDIAN 50TH         .037        .089                        .0001*                     L.005
          75TH         .062
          90TH
SECONDARY CODE

                      29009L       29305L        28009L       28302L        48009L        48302L       82009L       82302L
                      COPPER       COPPER        NICKEL       NICKEL        CADMIUM       CADMIUM       LEAD         LEAD
                      TOTAL        EXTRBLE.      TOTAL        EXTRBLE.      TOTAL         EXTRBLE.     TOTAL        EXTRBLE.

               SUBM   CU           CU            NI           NI            CD            CD           PB           PB
                ID    MG/L         MG/L          MG/L         MG/L          MG/L          MG/L         MG/L         MG/L
SAMPLES(FLAGS)        2(0)         1(0)          2(1)         1(0)          2(2)          1(1)                      3(2)
           LOW         .036         .030          .014         .016         L.001         L.001                     L.003
          HIGH         .066         .030         L.02          .016         L.01          L.001                     L.02
       AVERAGE         .051                       .017*                                                              .009*
      STD.DEV.         .021                       .004*                                                              .009*
   PERCNT:10TH
          25TH
   MEDIAN 50TH         .051                       .017*                     L.005                                    .005
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0010 -  0012 PAGE  80                          NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                         INDUSTRIAL MONITORING
STATION 20AL05EB3001    LAT. 53D 34M 47S  LONG. 113D 21M 50S   PR 3   UTM 12 343500E 5939150N  FOR MAR 11, 1981 TO JUL 25, 1984
CELANESE CANADA LTD EDMONTON                 SOUTH FLUME COMP.
S17 T53 R23 W4M

                         30009L      30305L      25003L      25304L      23009L      42304L      42009L      51003L
                          ZINC        ZINC      MANGANESE   MANGANESE   VANADIUM   MOLYBDENUM  MOLYBDENUM   ANTIMONY
                          TOTAL     EXTRBLE.      TOTAL     EXTRBLE.     TOTAL     EXTRBLE.      TOTAL       TOTAL

                   SUBM    ZN          ZN          MN          MN          V           MO          MO          SB
                    ID    MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            2(0)        1(0)        2(0)        1(0)        3(2)                    2(2)        1(0)
           LOW            .097        .380        .031        .10         L.001                   L.001       .004
          HIGH            .18         .380        .084        .10         L.01                    L.02        .004
       AVERAGE            .139                    .058                     .005*
      STD.DEV.            .059                    .037                     .005*
   PERCNT:10TH
          25TH
    MEDIAN 50TH           .139                    .058                    .004                    L.010
          75TH
          90TH
SECONDARY CODE
                                                                          02L

                         33005L      33104L      34005L      34102L      13111L      13306L      04102L      04304L
                         ARSENIC     ARSENIC    SELENIUM    SELENIUM    ALUMINUM    ALUMINUM    BERYLLIUM   BERYLLIUM
                         TOTAL      DISSOLVED   TOTAL       DISSOLVED   DISSOLVED   EXTRBLE.    DISSOLVED    EXTRBLE.

                   SUBM    AS          AS          SE          SE          AL          AL          BE          BE
                    ID    MG/L        MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            2(0)        1(0)        1(1)        1(1)        1(0)        2(0)        1(1)        2(2)
           LOW            .0008       .0010       L.001       L.0002      1820.       1.270       L.005       L.001
          HIGH            .002        .0010       L.001       L.0002      1820.       1.48        L.005       L.001
       AVERAGE            .0014                                                       1.375
      STD.DEV.            .0008                                                        .148
   PERCNT:10TH
          25TH
    MEDIAN 50TH           .0014                                                       1.375                   L.001
          75TH
          90TH
SECONDARY CODE                                07L                                     02L                     02L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  81                        NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                      INDUSTRIAL MONITORING
STATION 20AL05EB3003    LAT. 53D 34M 47S  LONG. 113D 21M 50S   PR 3   UTM 12 343500E 5939150N  FOR APR 29, 1980 TO JUL 26, 1984
CELANESE CANADA LTD EDMONTON                  NORTH FLUME GRAB
S17 T53 R23 W4M

                        02061F       10301L       10301F       10151L       10101L       02041L       97160S       97163S
                      TEMPERATURE      PH           PH       ALKALINITY   ALKALINITY    SPECIFIC    DISCHARGE    DISCHARGE
                      OF WATER                                 PHENOL        TOTAL      CONDUCT.     INSTANT       DAILY
                                                             PHTHALEIN                                              MEAN
                 SUBM                                           CACO3        CACO3
                   ID    DEG.C       PH UNITS     PH UNITS      MG/L         MG/L        US/CM        M3/S          CFS
SAMPLES(FLAGS)           11(0)        17(0)        2(0)         16(2)        17(0)       17(0)                     17(0)
           LOW             6.0          6.5         5.2            .0         84.0        377.                       .007
          HIGH            24.0          7.9         7.0           L.1         258.        812.                       .19
       AVERAGE            16.5                                    .0*        150.4        527.                       .1045
      STD.DEV.             5.3                                    .0*         39.8        144.                       .0549
   PERCNT:10TH            12.0          6.6                        .0        123.0        412.                       .03
          25TH            14.0          6.8                        .0         127.        420.                       .04
   MEDIAN 50TH            16.0          7.0         6.10           .0         138.        474.                       .123
          75TH            21.0          7.2                        .0        157.0        570.                       .123
          90TH            24.0          7.9                       L.1        211.0        762.                       .19
SECONDARY CODE

                        06201L       06202L       06301L       20103L       20105L       10602L       10604L       97160S
                      BICARBONT.   BICARBONT.   CARBONATE     CALCIUM      CALCIUM     HARDNESS     HARDNESS    DISCHARGE
                       (CALCD.)     (CALCD.)     (CALCD.)    DISSOLVED    DISSOLVED      TOTAL        TOTAL       INSTANT
                                                                          (CALCD.)     (CALCD.)
                 SUBM   HCO3         HCO3          CO3           CA           CA         CACO3        CACO3
                   ID  MG/L          MG/L         MG/L          MG/L         MG/L         MG/L         MG/L         M3/S
SAMPLES(FLAGS)          16(2)         6(0)        16(2)         16(0)        2(0)        12(0)         6(0)
           LOW          Q102.         103.           0.          33.0         42.6        127.7        151.5
          HIGH           315.         257.          Q0.           90.         42.9        311.2        330.0
       AVERAGE           183.*        170.           0.*         53.9         42.7        197.0        195.3
      STD.DEV.            50.*         51.           0.*         20.4           .2         69.0         67.6
   PERCNT:10TH           150.                        0.           35.                     149.2
          25TH           154.         150.           0.          41.6                     151.8         160.
   MEDIAN 50TH           166.         161.           0.          42.6         42.7        162.1        167.5
          75TH           193.         191.           0.          72.5                     258.4        195.0
          90TH          Q257.                       Q0.           88.                     310.3
SECONDARY CODE                                              11L 10L

                        11103L       12102L       19103L       09107L       17203L       16306L       26009L       26304L
                        SODIUM     MAGNESIUM    POTASSIUM     FLUORIDE     CHLORIDE     SULPHATE       IRON         IRON
                      DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED      TOTAL       EXTRBLE.

                 SUBM    NA           MG            K            F            CL          SO4           FE           FE
                   ID   MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)          17(0)        17(0)        17(0)        17(0)        17(0)        17(0)         4(0)        11(0)
           LOW           10.          11.          2.2          .24           4.         39.0         1.10          .24
          HIGH           42.         29.0          7.0         1.40         59.0        200.0         3.73         3.87
       AVERAGE          20.5         15.8         4.19         .636        18.25         91.7        2.027        1.537
      STD.DEV.           9.3          4.8         1.30         .304        12.46         44.3        1.210        1.136
   PERCNT:10TH          13.0         11.0          2.6          .26           9.          42.                      .440
          25TH           14.          12.          3.4          .53         11.6         67.0        1.165          .59
   MEDIAN 50TH          16.0          15.          3.9          .61          14.          75.        1.640         1.00
          75TH           23.         17.2          5.0          .64        20.00         135.        2.890         2.25
          90TH          37.0          22.          6.2         1.30          28.         145.                     2.69
SECONDARY CODE          11L          11L          11L       06L 05L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  82                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB3003    LAT. 53D 34M 47S  LONG. 113D 21M 50S   PR 3   UTM 12 343500E 5939150N  FOR APR 29, 1980 TO JUL 26, 1984
CELANESE CANADA LTD EDMONTON              NORTH FLUME GRAB
S17 T53 R23 W4M

                      07105L      07205L      07562L      07021L      07906L      07905L      15421L      97160S
                     NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN   PHOSPHORUS  DISCHARGE
                     DISSOLVED   DISSOLVED   DISSOLVED    TOTAL    PARTICULATE PARTICULATE   TOTAL      INSTANT
                     NO3 & NO2   NITRITE     AMMONIA     KJELDAHL     TOTAL      (CALCD.)
                SUBM     N           N           N           N           N           N           P
                 ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        M3/S
SAMPLES(FLAGS)        17(10)      17(13)      14(0)       16(0)       10(0)                   16(0)
           LOW          .004        .000        .03         .80         .45                     .24
          HIGH        19.0          .17        7.700       60.0         3.84                    2.860
       AVERAGE         2.084*       .045*      3.486       11.203       1.566                   1.247
      STD.DEV.         5.776*       .037*      2.669       13.868       1.219                    .732
  PERCNT:10TH           .006       L.003        .079        2.600        .530                    .44
          25TH         L.05         .02        1.410        5.100        .88                     .635
   MEDIAN 50TH         L.05        L.05        3.020        7.118       1.160                   1.135
          75TH         L.050       L.05        5.50        11.750       1.440                   1.605
          90TH        15.7         L.050       7.420       20.560       3.805                   2.450
SECONDARY CODE        10L         06L         61L         15L                               19L 06L

                      10474L      10407L      10511L      10453L      14101L      97160S      97163S
                     RESIDUE     RESIDUE     RESIDUE     RESIDUE      SILICA    DISCHARGE   DISCHARGE
                      TOTAL    NONFILTRABLE  VOLATILE   FILTRABLE    REACTIVE    INSTANT      DAILY
                                             NONFILTR.                                         MEAN
                SUBM                         (CALCD.)                  SIO2
                 ID   MG/L        MG/L        MG/L        MG/L        MG/L        M3/S         CFS
SAMPLES(FLAGS)        16(0)       17(0)       2(0)        11(0)       17(0)                   17(0)
           LOW         288.          9.         16.0        240.         3.00                   .007
          HIGH         838.        158.         37.0        680.         9.20                   .19
       AVERAGE         440.2        52.2        26.5        391.8        6.02                   .1045
      STD.DEV.         168.7        42.5        14.8        147.6        1.97                   .0549
  PERCNT:10TH          288.         11.                     270.         3.9                    .03
          25TH         313.5        21.                     300.         4.8                    .04
   MEDIAN 50TH         376.0        42.0        26.5        320.         5.3                    .123
          75TH         499.0        65.                     430.0        8.2                    .123
          90TH         733.        138.                     650.         9.0                    .19
SECONDARY CODE        71L         01L                     51L         02L

                      00205L      02074L      06537L      06524L      02001L      16101L      10701L      06608L
                      TOTAL     TURBIDITY    PHENOLIC    OIL AND      ODOUR     SULPHIDE    SURFACT.     CYANIDE
                     DISSOLVED               MATERIAL    GREASE     THRESHOLD   DISSOLVED   N-ALKYL
                      SOLIDS                                          NUMBER                SULPHNTS.
                SUBM                         PHENOL                                 S          LAS         CN
                 ID   MG/L        NTU         MG/L        MG/L         TON        MG/L        MG/L        MG/L
SAMPLES(FLAGS)        15(0)       15(0)       17(0)       17(0)       14(0)        1(0)       14(0)        2(2)
           LOW         187.4         4.0        .010         1.0          1.        1.50         .04      L.002
          HIGH         606.0        25.0        .789        38.1       1000.        1.50        2.50      L.002
       AVERAGE         300.2        11.6        .096         8.800      181.                     .523
      STD.DEV.         117.7         7.4        .182         9.902      354.                     .690
  PERCNT:10TH          211.          4.0        .015         1.4          1.                     .06
          25TH         217.          5.0        .025         3.1          2.                     .11
   MEDIAN 50TH         256.0        10.0        .050         4.900       10.                     .235     L.0020
          75TH         370.0        18.0        .070        10.0        128.                     .55
          90TH         474.         20.0        .140        27.0       1000.                    1.35
SECONDARY CODE                    73L                     21L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  83                      NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                       INDUSTRIAL MONITORING
STATION 20AL05EB3003    LAT. 53D 34M 47S  LONG. 113D 21M 50S   PR 3   UTM 12 343500E 5939150N  FOR APR 29, 1980 TO JUL 26, 1984
CELANESE CANADA LTD EDMONTON               NORTH FLUME GRAB
S17 T53 R23 W4M

                          08304L       08202L       06107L       06154L       06001L       06051L       06006L       06905L
                          OXYGEN       OXYGEN       CARBON       CARBON       CARBON       CARBON       CARBON       CARBON
                           TOTAL      BIOCHEM.     DISSOLVED    DISSOLVED      TOTAL        TOTAL       TOTAL      PARTICULATE
                            COD      DEMAND-BOD     ORGANIC     INORGANIC     ORGANIC     INORGANIC                   TOTAL
                  SUBM      02            02          C            C            C            C            C            C
                   ID      MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)             17(0)        14(0)        10(0)        10(0)         7(0)         1(0)         1(0)        10(0)
           LOW              38.2         8.           5.7          4.           7.4         32.         240.           2.81
          HIGH            1388.0       288.0         49.3         52.         208.          32.         240.          73.05
       AVERAGE             286.4        91.93        21.67        36.48        83.70                                 18.04
      STD.DEV.             326.6        89.12        15.58        12.82        75.65                                 21.11
   PERCNT:10TH              72.2        11.8          5.85        18.00                                               3.45
          25TH             103.0        32.0         10.7         35.          11.5                                   5.28
   MEDIAN 50TH             138.2        53.85        16.50        37.60        74.5                                   8.70
          75TH             337.        180.0         39.          43.0        156.3                                  24.32
          90TH             642.0       207.0         44.80        48.60                                              48.85
SECONDARY CODE            01L                                              07L 05L

                          24101L       24009L       24302L       80015L       80011L       27009L       27302L       47304L
                         CHROMIUM     CHROMIUM     CHROMIUM     MERCURY      MERCURY       COBALT       COBALT       SILVER
                        HEXAVALENT      TOTAL      EXTRBLE.      TOTAL        TOTAL        TOTAL       EXTRBLE.     EXTRBLE.

                  SUBM     CR           CR           CR           HG           HG           CO           CO           AG
                   ID      MG/L         MG/L         MG/L         MG/L         UG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)            14(10)       14(0)         2(0)        16(12)        1(1)        14(12)        2(1)         4(4)
           LOW             L.001         .009         .02        L.0001        L.02         L.001        L.001        L.02
          HIGH             L.01         1.3           .02          .0004       L.02         L.01          .001        L.02
       AVERAGE              .005*        .323         .020         .0001*                    .004*        .001*
      STD.DEV.              .004*        .399         .000         .0001*                    .004*        .000*
   PERCNT:10TH             L.001         .013                     L.0001                    L.001
          25TH             L.001         .019                     L.0001                    L.001                     L.020
   MEDIAN 50TH              .004         .124         .020        L.0001                    L.001         .001*       L.020
          75TH             L.01          .623                       .0001*                  L.01                      L.020
          90TH             L.01          .725                       .0002                   L.01
SECONDARY CODE

                          29009L       29305L       28009L       28302L       48009L       48302L       82009L       d2302L
                          COPPER       COPPER       NICKEL       NICKEL       CADMIUM      CADMIUM       LEAD         LEAD
                          TOTAL       EXTRBLE.      TOTAL       EXTRBLE.      TOTAL       EXTRBLE.      TOTAL       EXTRBLE.

                  SUBM     CU           CU           NI           NI           CD           CD           PB           PB
                   ID      MG/L         MG/L         MG/L         MG/L         MS/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)            14(0)         2(0)        14(2)         2(0)        13(10)        2(2)         5(0)        11(5)
           LOW              .017         .230        L.001         .009        L.001        L.001         .005        L.003
          HIGH              .229         .290         .050         .030        L.01         L.001         .043         .020
       AVERAGE              .091         .260         .017*        .020         .004*                     .016         .014*
      STD.DEV.              .058         .042         .013*        .015         .004*                     .016         .007*
   PERCNT:10TH              .037                      .005                     L.001                                   .004
          25TH              .046                      .007                     L.001                      .005         .008
   MEDIAN 50TH              .075         .260         .014         .020         .002        L.001         .012         .016
          75TH              .134                      .022                     L.01                       .016        L.02
          90TH              .152                      .03                      L.01                                  L.02
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0010 -  0012 PAGE  84                  NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                INDUSTRIAL MONITORING
STATION 20AL05EB3003    LAT. 53D 34M 47S  LONG. 113D 21M 50S   PR 3   UTM 12 343500E 5939150N  FOR APR 29, 1980 TO JUL 26, 1984
CELANESE CANADA LTD EDMONTON             NORTH FLUME GRAB
S17 T53 R23 W4M
                             30009L      30305L      25003L      25304L      23009L      42304L      42009L      51003L
                              ZINC        ZINC      MANGANESE   MANGANESE   VANADIUM   MOLYBDENUM  MOLYBDENUM   ANTIMONY
                             TOTAL      EXTRBLE.     TOTAL      EXTRBLE.     TOTAL      EXTRBLE.     TOTAL       TOTAL

                     SUBM     ZN          ZN          MN          MN          V           MO          MO          SB
                      ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)               13(0)       2(0)        14(0)       2(0)        14(4)                   12(10)      3(2)
           LOW                .034        .150        .046        .14         .001                   L.001       L.001
          HIGH                .52         .170        .278        .58         .030                   L.02         .0013
       AVERAGE                .128        .160        .134        .360        .007*                   .008*       .0011*
      STD.DEV.                .138        .014        .070        .311        .007*                   .009*       .0002*
   PERCNT:10TH                .037                    .053                    .001                   L.001
          25TH                .05                     .076                    .004                   L.001
   MEDIAN 50TH                .075        .160        .135        .360        .005                    .002*      L.001
          75TH                .118                    .173                   L.01                    L.020
          90TH                .276                    .227                   L.01                    L.02
SECONDARY CODE                                                               02L

                             33005L      33104L      34005L      34102L      13111L      13306L      04102L      04304L
                             ARSENIC     ARSENIC     SELENIUM    SELENIUM    ALUMINUM    ALUMINUM    BERYLLIUM   BERYLLIUM
                             TOTAL      DISSOLVED    TOTAL      DISSOLVED   DISSOLVED    EXTRBLE.    DISSOLVED    EXTRBLE.

                     SUBM     AS          AS          SE          SE          AL          AL          BE          BE
                      ID     MG/L        MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)               9(2)        2(0)        8(6)        2(2)        3(0)        10(0)       3(3)        10(10)
           LOW               .0007       .0033       L.0002      L.0002      750.         .252       L.005       L.001
          HIGH               .0020       .0047        .0026      L.0002      1230.       1.430       L.005       L.001
       AVERAGE               .0015*      .0040        .0007*                 1043.33      .713
      STD.DEV.               .0005*      .0010        .0008*                  257.16      .445
   PERCNT:10TH                                                                            .269                    L.001
          25TH               L.001                   L.0002                               .320                    L.001
   MEDIAN 50TH               .0015       .0040        .0004*     L.0002      1150.        .656       L.005       L.001
          75TH               .002                    L.0010                               .93                     L.001
          90TH                                                                           1.420                    L.001
SECONDARY CODE                                       07L                                 02L                     02L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  85                        NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                       INDUSTRIAL MONITORING
STATION 20AL05EB3004    LAT. 53D 34M 47S  LONG. 113D 21M 50S   PR 3   UTM 12 343500E 5939150N  FOR MAR 11, 1981 TO MAR 11, 1981
CELANESE CANADA LTD EDMONTON               NORTH FLUME COMP.
S17 T53 R23 W4M

                         02061F       10301L       10301F       10151L       10101L       02041L       97160S       97163S
                       TEMPERATURE      PH           PH       ALKALINITY   ALKALINITY    SPECIFIC    DISCHARGE    DISCHARGE
                       OF WATER                                 PHENOL       TOTAL       CONDUCT.     INSTANT       DAILY
                                                              PHTHALEIN                                             MEAN
                 SUBM                                           CACO3        CACO3
                  ID     DEG.C       PH UNITS     PH UNITS      MG/L         MG/L         US/CM        M3/S          CFS
SAMPLES(FLAGS)            1(0)         1(0)         1(0)         1(0)         1(0)         1(0)                      1(0)
           LOW             6.0          7.3          6.6           .0        170.0         594.                      .007
          HIGH             6.0          7.3          6.6           .0        170.0         594.                      .007
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE

                         06201L       06202L       06301L       20103L       20105L       10602L       10604L       97160S
                       BICARBONT.   BICARBONT.   CARBONATE     CALCIUM      CALCIUM     HARDNESS     HARDNESS     DISCHARGE
                        (CALCD.)     (CALCD.)     (CALCD.)    DISSOLVED    DISSOLVED      TOTAL        TOTAL       INSTANT
                                                                           (CALCD.)     (CALCD.)
                 SUBM    HCO3          HCO3         CO3           CA           CA         CACO3        CACO3
                  ID   MG/L          MG/L         MG/L         MG/L         MG/L         MG/L         MG/L          M3/S
SAMPLES(FLAGS)            1(0)                      1(0)         1(0)                                  1(0)
           LOW            207.                        0.         62.0                                 233.0
          HIGH            207.                        0.         62.0                                 233.0
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE                                                   11L

                         11103L       12102L       19103L       09107L       17203L       16306L       26009L       26304L
                         SODIUM     MAGNESIUM    POTASSIUM     FLUORIDE     CHLORIDE     SULPHATE       IRON         IRON
                       DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED      TOTAL       EXTRBLE.

                 SUBM     NA           MG           K            F            CL          SO4          FE            FE
                  ID     MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L          MG/L
SAMPLES(FLAGS)            1(0)         1(0)         1(0)         1(0)         1(0)         1(0)         1(0)
           LOW            32.0         19.0          7.0          .41         28.0        117.0         2.27
          HIGH            32.0         19.0          7.0          .41         28.0        117.0         2.27
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE            11L          11L          11L          06L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  86                  NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                 INDUSTRIAL MONITORING
STATION 20AL05EB3004    LAT. 53D 34M 47S  LONG. 113D 21M 50S   PR 3   UTM 12 343500E 5939150N  FOR MAR 11, 1981 TO MAR 11, 1981
CELANESE CANADA LTD EDMONTON               NORTH FLUME COMP.
S17 T53 R23 W4M

                         07105L      07205L      07562L      07021L      07906L      07905L      15421L      97160S
                        NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN   PHOSPHORUS  DISCHARGE
                        DISSOLVED   DISSOLVED   DISSOLVED    TOTAL     PARTICULATE PARTICULATE   TOTAL      INSTANT
                        NO3 & NO2    NITRITE    AMMONIA     KJELDAHL     TOTAL      (CALCD.)
                 SUBM       N           N           N           N           N           N           P
                  ID      MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        M3/S
SAMPLES(FLAGS)             1(1)        1(1)        1(0)        1(0)                                1(0)
           LOW             L.02        L.02        8.0         16.0                                1.80
          HIGH             L.02        L.02        8.0         16.0                                1.80
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE                                     61L         15L                                 19L

                         10474L      10407L      10511L      10453L      14101L      97160S      97163S
                         RESIDUE     RESIDUE     RESIDUE     RESIDUE     SILICA     DISCHARGE   DISCHARGE
                          TOTAL    NONFILTRABLE  VOLATILE   FILTRABLE   REACTIVE     INSTANT      DAILY
                                                NONFILTR.                                          MEAN
                 SUBM                            (CALCD.)                 SIO2
                  ID     MG/L        MG/L        MG/L        MG/L        MG/L        M3/S        CFS
SAMPLES(FLAGS)            1(0)        1(0)                                1(0)                    1(0)
           LOW           520.0        49.0                                7.0                     .007
          HIGH           520.0        49.0                                7.0                     .007
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE           71L         01L                                 02L

                         00205L      02074L      06537L      06524L      02001L      16101L      10701L      06608L
                         TOTAL      TURBIDITY    PHENOLIC    OIL AND     ODOUR      SULPHIDE    SURFACT.     CYANIDE
                        DISSOLVED                MATERIAL    GREASE    THRESHOLD   DISSOLVED    N-ALKYL
                         SOLIDS                                          NUMBER                 SULPHNTS.
                 SUBM                            PHENOL                                 S          LAS         CN
                  ID     MG/L        NTU         MG/L        MG/L        TON         MG/L        MG/L        MG/L
SAMPLES(FLAGS)            1(0)        1(0)        1(0)        1(0)        1(0)                    1(0)
           LOW           472.0        20.0        .025        12.0         2.                     .04
          HIGH           472.0        20.0        .025        12.0         2.                     .04
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE                                                21L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  87                            NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                           INDUSTRIAL MONITORING
STATION 20AL05EB3004    LAT. 53D 34M 47S  LONG. 113D 21M 50S   PR 3   UTM 12 343500E 5939150N  FOR MAR 11, 1981 TO MAR 11, 1981
CELANESE CANADA LTD EDMONTON                   NORTH FLUME COMP.
S17 T53 R23 W4M

                        08304L      08202L      06107L      06154L      06001L      06051L      06006L      06905L
                        OXYGEN      OXYGEN      CARBON      CARBON      CARBON      CARBON      CARBON      CARBON
                          TOTAL     BIOCHEM.    DISSOLVED   DISSOLVED    TOTAL       TOTAL      TOTAL      PARTICULATE
                           COD      DEMAND-BOD  ORGANIC     INORGANIC   ORGANIC     INORGANIC                 TOTAL
                 SUBM     02            02        C           C           C           C           C           C
                  ID    MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            1(0)        1(0)                                1(0)
           LOW            330.0       86.0                                117.9
          HIGH            330.0       86.0                                117.9
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE          01L                                             07L

                        24101L      24009L      24302L      80015L      80011L      27009L      27302L      47304L
                        CHROMIUM    CHROMIUM    CHROMIUM    MERCURY     MERCURY     COBALT      COBALT      SILVER
                        HEXAVALENT   TOTAL       EXTRBLE.    TOTAL       TOTAL       TOTAL       EXTRBLE.    EXTRBLE.

                 SUBM     CR          CR          CR          HG          HG          CO          CO          AG
                  ID    MG/L        MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            1(1)        1(0)                                1(1)        1(1)                    1(1)
           LOW            L.01         .55                                L.02        L.01                    L.02
          HIGH            L.01         .55                                L.02        L.01                    L.02
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE

                        29009L      29305L      28009L      28302L      48009L      48302L      82009L      82302L
                        COPPER      COPPER      NICKEL      NICKEL      CADMIUM     CADMIUM     LEAD        LEAD
                         TOTAL      EXTRBLE.    TOTAL       EXTRBLE.    TOTAL       EXTRBLE.    TOTAL       EXTRBLE.

                 SUBM     CU          CU          NI          NI          CD          CD          PB          PB
                  ID    MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            1(0)                    1(0)                    1(1)                                1(1)
           LOW             .078                    .04                    L.01                                L.02
          HIGH             .078                    .04                    L.01                                L.02
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
```

```
REQUEST 0010 -  0012 PAGE  88                       NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                     INDUSTRIAL MONITORING
STATION 20AL05EB3004    LAT. 53D 34M 47S  LONG. 113D 21M 50S   PR 3   UTM 12 343500E 5939150N  FOR MAR 11, 1981 TO MAR 11, 1981
CELANESE CANADA LTD EDMONTON               NORTH FLUME COMP.
S17 T53 R23 W4M

                         30009L      30305L      25003L      25304L      23009L      42304L      42009L      51003L
                         ZINC        ZINC        MANGANESE   MANGANESE   VANADIUM    MOLYBDENUM  MOLYBDENUM  ANTIMONY
                         TOTAL       EXTRBLE.    TOTAL       EXTRBLE.    TOTAL       EXTRBLE.    TOTAL       TOTAL

                  SUBM    ZN          ZN          MN          MN          V           MO          MO          SB
                   ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            1(0)                    1(0)                    1(1)                    1(1)        1(1)
           LOW             .38                     .126                   L.01                    L.02        L.001
          HIGH             .38                     .126                   L.01                    L.02        L.001
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
                         33005L      33104L      34005L      34102L      13111L      13306L      04102L      04304L
                         ARSENIC     ARSENIC     SELENIUM    SELENIUM    ALUMINUM    ALUMINUM    BERYLLIUM   BERYLLIUM
                         TOTAL       DISSOLVED   TOTAL       DISSOLVED   DISSOLVED   EXTRBLE.    DISSOLVED   EXTRBLE.

                  SUBM    AS          AS          SE          SE          AL          AL          BE          BE
                   ID     MG/L        MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            1(1)                    1(1)                    1(0)                    1(1)
           LOW            L.001                   L.001                   1220.                   L.005
          HIGH            L.001                   L.001                   1220.                   L.005
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE                                    07L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  89                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB3007    LAT. 53D 34M 47S  LONG. 113D 21M 50S   PR 3   UTM 12 343500E 5939150N  FOR JUL 05, 1983 TO JUL 05, 1983
CELANESE CANADA LTD EDMONTON               STORM WATER POND GRAB
S17 T53 R23 W4M

                      02061F       10301L       10301F       10151L       10101L       02041L       97160S       97163S
                    TEMPERATURE      PH           PH       ALKALINITY   ALKALINITY    SPECIFIC    DISCHARGE     DISCHARGE
                    OF WATER                                 PHENOL        TOTAL      CONDUCT.     INSTANT       DAILY
                                                           PHTHALEIN                                               MEAN
                SUBM                                         CACO3        CACO3
                 ID    DEG.C       PH UNITS     PH UNITS     MG/L         MG/L         US/CM        M3/S          CFS
SAMPLES(FLAGS)                       1(0)                     1(1)         1(0)         1(0)
           LOW                       7.14                      L.1         125.0        3922.
          HIGH                       7.14                      L.1         125.0        3922.
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE

                      06201L       06202L       06301L       20103L       20105L       10602L       10604L       97160S
                    BICARBONT.   BICARBONT.   CARBONATE     CALCIUM      CALCIUM     HARDNESS     HARDNESS     DISCHARGE
                     (CALCD.)     (CALCD.)     (CALCD.)    DISSOLVED    DISSOLVED      TOTAL        TOTAL        INSTANT
                                                                         (CALCD.)     (CALCD.)
                SUBM   HCO3         HCO3          CO3          CA           CA          CACO3        CACO3
                 ID  MG/L           MG/L         MG/L         MG/L         MG/L         MG/L         MG/L          M3/S
SAMPLES(FLAGS)          1(1)         1(0)         1(1)         1(0)                      1(0)
           LOW         Q152.         153.          Q0.        120.0                     419.4
          HIGH         Q152.         153.          Q0.        120.0                     419.4
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE

                      11103L       12102L       19103L       09107L       17203L       16306L       26009L       26304L
                      SODIUM      MAGNESIUM    POTASSIUM    FLUORIDE     CHLORIDE     SULPHATE       IRON         IRON
                    DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED      TOTAL       EXTRBLE.

                SUBM    NA           MG            K            F            CL          SO4           FE           FE
                 ID    MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)          1(0)         1(0)         1(0)         1(0)         1(0)         1(0)
           LOW         790.0         29.1         4.85          .30         99.00       1765.0
          HIGH         790.0         29.1         4.85          .30         99.00       1765.0
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE                                                 05L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  90
                                                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
STATION 20AL05EB3007    LAT. 53D 34M 47S  LONG. 113D 21M 50S   PR 3   UTM 12 343500E 5939150N  FOR JUL 05, 1983 TO JUL 05, 1983
CELANESE CANADA LTD EDMONTON                                INDUSTRIAL MONITORING
S17 T53 R23 W4M                                        STORM WATER POND GRAB

                        07105L      07205L      07562L      07021L      07906L       07905L       15421L      97160S
                       NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN     NITROGEN    PHOSPHORUS  DISCHARGE
                       DISSOLVED   DISSOLVED   DISSOLVED    TOTAL     PARTICULATE  PARTICULATE    TOTAL      INSTANT
                 SUBM  NO3 & NO2    NITRITE    AMMONIA     KJELDAHL     TOTAL       (CALCD.)
                  ID       N           N           N           N           N            N            P
SAMPLES(FLAGS)           MG/L        MG/L        MG/L        MG/L        MG/L         MG/L         MG/L        M3/S
           LOW            1(0)        1(0)                    1(0)                                  1(0)
          HIGH             .048        .010                  12.00                                   .560
       AVERAGE             .048        .010                  12.00                                   .560
      STD.DEV.
  PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE           10L         06L                    15L                                  06L

                        10474L      10407L      10511L      10453L      14101L       97160S       97163S
                        RESIDUE     RESIDUE     RESIDUE     RESIDUE     SILICA      DISCHARGE    DISCHARGE
                         TOTAL    NONFILTRABLE  VOLATILE   FILTRABLE   REACTIVE      INSTANT       DAILY
                 SUBM                          NONFILTR.                                          MEAN
                  ID                           (CALCD.)                   SIO2
SAMPLES(FLAGS)           MG/L        MG/L        MG/L        MG/L         MG/L        M3/S         CFS
           LOW            1(0)        1(0)                    1(0)         1(0)
          HIGH          2920.0        14.0                  2900.0         6.80
       AVERAGE          2920.0        14.0                  2900.0         6.80
      STD.DEV.
  PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE           71L         01L                    51L

                        00205L      02074L      06537L      06524L      02001L       16101L       10701L      06608L
                         TOTAL     TURBIDITY   PHENOLIC     OIL AND      ODOUR       SULPHIDE     SURFACT.     CYANIDE
                       DISSOLVED               MATERIAL     GREASE     THRESHOLD    DISSOLVED     N-ALKYL
                 SUBM   SOLIDS                                          NUMBER                   SULPHNTS.
                  ID     MG/L                   PHENOL                                  S           LAS
SAMPLES(FLAGS)                       NTU         MG/L        MG/L          TON         MG/L         MG/L         CN
           LOW                        1(0)        1(0)        1(0)         1(0)                      1(0)      MG/L
          HIGH                         9.0        .030        1.0           2.                        .09
       AVERAGE                         9.0        .030        1.0           2.                        .09
      STD.DEV.
  PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q    21L
```

```
REQUEST 0007 -  0009 PAGE  91                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB3007    LAT. 53D 34M 47S  LONG. 113D 21M 50S   PR 3   UTM 12 343500E 5939150N  FOR JUL 05, 1983 TO JUL 05, 1983
CELANESE CANADA LTD EDMONTON               STORM WATER POND GRAB
S17 T53 R23 W4M
                         08304L      08202L      06107L      06154L      06001L      06051L      06006L      06905L
                         OXYGEN      OXYGEN      CARBON      CARBON      CARBON      CARBON      CARBON      CARBON
                           TOTAL     BIOCHEM.    DISSOLVED   DISSOLVED     TOTAL       TOTAL     TOTAL       PARTICULATE
                             COD     DEMAND-BOD   ORGANIC    INORGANIC   ORGANIC     INORGANIC                 TOTAL
                    SUBM    O2           O2          C           C           C           C           C           C
                     ID  MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)             1(0)        1(0)                                1(0)
           LOW             100.        31.0                                18.3
          HIGH             100.        31.0                                18.3
       AVERAGE
      STD.DEV.
  PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE           01L                                             05L
                         24101L      24009L      24302L      80015L      80011L      27009L      27302L      47304L
                        CHROMIUM    CHROMIUM    CHROMIUM     MERCURY     MERCURY     COBALT      COBALT      SILVER
                       HEXAVALENT    TOTAL        EXTRBLE.   TOTAL       TOTAL       TOTAL       EXTRBLE.    EXTRBLE.

                    SUBM    CR          CR          CR          HG          HG          CO          CO          AG
                     ID   MG/L        MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)             1(0)                    1(1)        1(1)                                1(1)
           LOW             .003                    L.01        L.0001                              L.001
          HIGH             .003                    L.01        L.0001                              L.001
       AVERAGE
      STD.DEV.
  PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
                         29009L      29305L      28009L      28302L      48009L      48302L      82009L      82302L
                         COPPER      COPPER      NICKEL      NICKEL      CADMIUM     CADMIUM     LEAD        LEAD
                          TOTAL      EXTRBLE.    TOTAL       EXTRBLE.    TOTAL       EXTRBLE.    TOTAL       EXTRBLE.

                    SUBM    CU          CU          NI          NI          CD          CD          PB          PB
                     ID   MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)                         1(0)                    1(0)                    1(1)                    1(1)
           LOW                         .005                    .005                    L.001                   L.002
          HIGH                         .005                    .005                    L.001                   L.002
       AVERAGE
      STD.DEV.
  PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
```

```
REQUEST 0010 -  0012 PAGE  92
                                                        NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                          INDUSTRIAL MONITORING
STATION 20AL05EB3007    LAT. 53D 34M 47S  LONG. 113D 21M 50S   PR 3   UTM 12 343500E 5939150N  FOR JUL 05, 1983 TO JUL 05, 1983
CELANESE CANADA LTD EDMONTON                  STORM WATER POND GRAB
S17 T53 R23 W4M

                            30009L     30305L     25003L     25304L     23009L     42304L      42009L      51003L
                             ZINC       ZINC     MANGANESE  MANGANESE  VANADIUM  MOLYBDENUM  MOLYBDENUM   ANTIMONY
                            TOTAL     EXTRBLE.    TOTAL     EXTRBLE.    TOTAL     EXTRBLE.     TOTAL       TOTAL
                    SUBM
                     ID      ZN         ZN         MN         MN         V          MO          MO          SB
SAMPLES(FLAGS)              MG/L       MG/L       MG/L       MG/L       MG/L       MG/L        MG/L        MG/L
               LOW                     1(0)                  1(0)       1(0)
              HIGH                      .003                  .17        .001
           AVERAGE                      .003                  .17        .001
          STD.DEV.
       PERCNT:10TH
              25TH
       MEDIAN 50TH
              75TH
              90TH
SECONDARY CODE
                                                                        02L

                            33005L     33104L     34005L     34102L     13111L     13306L      04102L      04304L
                            ARSENIC    ARSENIC   SELENIUM   SELENIUM   ALUMINUM   ALUMINUM   BERYLLIUM   BERYLLIUM
                            TOTAL     DISSOLVED   TOTAL     DISSOLVED  DISSOLVED  EXTRBLE.   DISSOLVED    EXTRBLE.
                    SUBM
                     ID      AS         AS         SE         SE         AL         AL          BE          BE
SAMPLES(FLAGS)              MG/L       MG/L       MG/L       MG/L       UG/L       MG/L        MG/L        MG/L
               LOW                     1(0)                  1(1)                  1(0)                    1(1)
              HIGH                      .0026                L.0002                 .04                    L.001
           AVERAGE                      .0026                L.0002                 .04                    L.001
          STD.DEV.
       PERCNT:10TH
              25TH
       MEDIAN 50TH
              75TH
              90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q                          02L                    02L
```

```
REQUEST 0001 -  0003 PAGE  93                   NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                 INDUSTRIAL MONITORING
STATION 20AL05EB3200    LAT. 53D 34M 48S  LONG. 113D 24M  2S   PR 3   UTM 12 341100E 5939250N  FOR MAR 12, 1981 TO MAR 12, 1981
DOMTAR CHEMICALS GROUP EDMONTON          FINAL EFFLUENT GRAB
N S13 T53 R24 W4M

                       02061F       10301L       10301F       10151L       10101L       02041L       97160S       97163S
                     TEMPERATURE      PH           PH       ALKALINITY   ALKALINITY    SPECIFIC    DISCHARGE    DISCHARGE
                      OF WATER                                PHENOL       TOTAL       CONDUCT.     INSTANT       DAILY
                                                            PHTHALEIN                                              MEAN
                 SUBM                                         CACO3        CACO3
                  ID   DEG.C      PH UNITS     PH UNITS       MG/L         MG/L         US/CM        M3/S          CFS
SAMPLES(FLAGS)          1(0)        1(0)         1(0)         1(0)         1(0)         1(0)                      1(0)
           LOW          14.5         6.0          5.5           .0         70.0         451.                     .0129
          HIGH          14.5         6.0          5.5           .0         70.0         451.                     .0129
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE

                       06201L       06202L       06301L       20103L       20105L       10602L       10604L       97160S
                     BICARBONT.   BICARBONT.   CARBONATE     CALCIUM      CALCIUM     HARDNESS     HARDNESS     DISCHARGE
                      (CALCD.)     (CALCD.)     (CALCD.)    DISSOLVED    DISSOLVED      TOTAL        TOTAL        INSTANT
                                                                          (CALCD.)     (CALCD.)
                 SUBM  HCO3         HCO3          CO3          CA           CA          CACO3        CACO3
                  ID  MG/L          MG/L          MG/L         MG/L         MG/L         MG/L         MG/L         M3/S
SAMPLES(FLAGS)          1(0)                      1(0)         1(0)                                   1(0)
           LOW           85.                        0.         27.6                                  112.6
          HIGH           85.                        0.         27.6                                  112.6
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE                                              11L

                       11103L       12102L       19103L       09107L       17203L       16306L       26009L       26304L
                       SODIUM     MAGNESIUM    POTASSIUM     FLUORIDE     CHLORIDE     SULPHATE       IRON         IRON
                     DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED      TOTAL       EXTRBLE.

                 SUBM    NA           MG            K            F            CL          SO4           FE           FE
                  ID    MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)          1(0)         1(0)         1(0)         1(0)         1(0)         1(0)         1(0)
           LOW          28.3         10.6          5.6          .17         62.8         42.0         9.84
          HIGH          28.3         10.6          5.6          .17         62.8         42.0         9.84
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE          11L          11L          11L          06L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  94                      NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                     INDUSTRIAL MONITORING
STATION 20AL05EB3200    LAT. 53D 34M 48S  LONG. 113D 24M  2S   PR 3   UTM 12 341100E 5939250N  FOR MAR 12, 1981 TO MAR 12, 1981
DOMTAR CHEMICALS GROUP EDMONTON          FINAL EFFLUENT GRAB
N S13 T53 R24 W4M

                          07105L       07205L       07562L       07021L       07906L       07905L       15421L        97160S
                         NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN    PHOSPHORUS    DISCHARGE
                         DISSOLVED    DISSOLVED    DISSOLVED     TOTAL     PARTICULATE  PARTICULATE    TOTAL        INSTANT
                         NO3 & NO2    NITRITE      AMMONIA      KJELDAHL      TOTAL       (CALCD.)
                   SUBM      N            N            N            N            N            N            P
                    ID     MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L          M3/S
SAMPLES(FLAGS)             1(0)         1(0)         1(0)         1(0)                                   1(0)
           LOW              .03          .03         7.00          7.9                                    .20
          HIGH              .03          .03         7.00          7.9                                    .20
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE                                      61L          15L                                     19L

                          10474L       10407L       10511L       10453L       14101L       97160S       97163S
                          RESIDUE      RESIDUE      RESIDUE      RESIDUE      SILICA      DISCHARGE    DISCHARGE
                           TOTAL    NONFILTRABLE   VOLATILE    FILTRABLE     REACTIVE      INSTANT       DAILY
                                                  NONFILTR.                                               MEAN
                   SUBM                           (CALCD.)                     SIO2
                    ID    MG/L         MG/L         MG/L         MG/L         MG/L          M3/S          CFS
SAMPLES(FLAGS)             1(0)         1(0)                                   1(0)                      1(0)
           LOW            302.0         17.0                                    5.0                      .0129
          HIGH            302.0         17.0                                    5.0                      .0129
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE            71L          01L                                     02L

                          00205L       02074L       06537L       06524L       02001L       16101L       10701L        06608L
                           TOTAL      TURBIDITY    PHENOLIC     OIL AND       ODOUR       SULPHIDE     SURFACT.        CYANIDE
                         DISSOLVED                 MATERIAL     GREASE      THRESHOLD    DISSOLVED     N-ALKYL
                          SOLIDS                                              NUMBER                   SULPHNTS.
                   SUBM                             PHENOL                                    S          LAS            CN
                    ID     MG/L        NTU          MG/L         MG/L          TON          MG/L         MG/L          MG/L
SAMPLES(FLAGS)             1(0)                     1(0)         1(0)                                    1(1)
           LOW            262.0                     .060          3.0                                    L.01
          HIGH            262.0                     .060          3.0                                    L.01
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE                                                   21L
```

```
REQUEST 0007 -  0009 PAGE  95                      NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                     INDUSTRIAL MONITORING
STATION 20AL05EB3200    LAT. 53D 34M 48S  LONG. 113D 24M  2S   PR 3   UTM 12 341100E 5939250N  FOR MAR 12, 1981 TO MAR 12, 1981
DOMTAR CHEMICALS GROUP EDMONTON             FINAL EFFLUENT GRAB
N S13 T53 R24 W4M

                        08304L      08202L      06107L      06154L      06001L      06051L      06006L      06905L
                        OXYGEN      OXYGEN      CARBON      CARBON      CARBON      CARBON      CARBON      CARBON
                         TOTAL     BIOCHEM.   DISSOLVED   DISSOLVED      TOTAL       TOTAL     TOTAL     PARTICULATE
                          COD     DEMAND-BOD   ORGANIC    INORGANIC    ORGANIC    INORGANIC                 TOTAL
                  SUBM    02           02         C           C           C           C           C           C
                   ID   MG/L         MG/L       MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           1(0)                                           1(0)
           LOW          358.0                                          130.8
          HIGH          358.0                                          130.8
       AVERAGE
      STD.DEV.
  PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE          01L                                            07L

                        24101L      24009L      24302L      80015L      80011L      27009L      27302L      47304L
                       CHROMIUM    CHROMIUM    CHROMIUM    MERCURY     MERCURY     COBALT      COBALT      SILVER
                      HEXAVALENT    TOTAL      EXTRBLE.     TOTAL       TOTAL       TOTAL     EXTRBLE.    EXTRBLE.

                  SUBM    CR          CR          CR          HG          HG          CO          CO          AG
                   ID   MG/L        MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           1(1)        1(0)                                1(1)        1(1)                    1(1)
           LOW           L.01         .04                                L.02        L.01                    L.02
          HIGH           L.01         .04                                L.02        L.01                    L.02
       AVERAGE
      STD.DEV.
  PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE

                        29009L      29305L      28009L      28302L      48009L      48302L      82009L      82302L
                        COPPER      COPPER      NICKEL      NICKEL      CADMIUM     CADMIUM      LEAD        LEAD
                         TOTAL     EXTRBLE.     TOTAL      EXTRBLE.     TOTAL      EXTRBLE.     TOTAL     EXTRBLE.

                  SUBM    CU          CU          NI          NI          CD          CD          PB          PB
                   ID   MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           1(0)                    1(1)                    1(1)                                1(1)
           LOW            .01                    L.02                    L.01                                L.02
          HIGH            .01                    L.02                    L.01                                L.02
       AVERAGE
      STD.DEV.
  PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
                                                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                     INDUSTRIAL MONITORING
STATION 20AL05EB3200    LAT. 53D 34M 48S  LONG. 113D 24M  2S   PR 3   UTM 12 341100E 5939250N  FOR MAR 12, 1981 TO MAR 12, 1981
DOMTAR CHEMICALS GROUP EDMONTON          FINAL EFFLUENT GRAB
N S13 T53 R24 W4M

                        30009L      30305L      25003L      25304L      23009L      42304L      42009L      51003L
                         ZINC        ZINC      MANGANESE   MANGANESE   VANADIUM   MOLYBDENUM  MOLYBDENUM   ANTIMONY
                        TOTAL      EXTRBLE.     TOTAL      EXTRBLE.     TOTAL      EXTRBLE.     TOTAL       TOTAL

                  SUBM    ZN          ZN          MN          MN          V           MO          MO          SB
                   ID    MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           1(0)                    1(0)                    1(1)                    1(1)        1(0)
           LOW            .04                     .41                    L.01                    L.02        .002
          HIGH            .04                     .41                    L.01                    L.02        .002
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
                        33005L      33104L      34005L      34102L      13111L      13306L      04102L      04304L
                        ARSENIC     ARSENIC    SELENIUM    SELENIUM    ALUMINUM    ALUMINUM   BERYLLIUM   BERYLLIUM
                       TOTAL      DISSOLVED   TOTAL       DISSOLVED   DISSOLVED   EXTRBLE.   DISSOLVED    EXTRBLE.

                  SUBM    AS          AS          SE          SE          AL          AL          BE          BE
                   ID    MG/L        MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           1(0)                    1(1)
           LOW           .001                    L.001
          HIGH           .001                    L.001
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE                                   07L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE  97                  NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                INDUSTRIAL MONITORING
STATION 20AL05EB4800    LAT. 53D 43M 20S  LONG. 113D 14M 39S   PR 3   UTM 12 351950E 5954750N  FOR JUN 16, 1980 TO APR 12, 1984
ALBERTA FOOD PRODUCTS LTD FT SASK.          FINAL EFFLUENT GRAB
RIVER LOTS 16 18 20 MD STURGEON 90

                         02061F       10301L       10301F       10151L       10101L       02041L       97160S       97163S
                       TEMPERATURE      PH           PH       ALKALINITY   ALKALINITY    SPECIFIC    DISCHARGE    DISCHARGE
                        OF WATER                                PHENOL        TOTAL      CONDUCT.     INSTANT       DAILY
                                                               PHTHALEIN                                             MEAN
                  SUBM                                            CACO3        CACO3
                   ID    DEG.C        PH UNITS     PH UNITS       MG/L         MG/L         US/CM         M3/S         CFS
SAMPLES(FLAGS)           16(0)        20(0)        4(0)          20(1)        16(0)        20(0)                      15(0)
           LOW            13.0         4.25         6.4            .0          36.0         252.                      .024
          HIGH            28.5         7.9          7.7           L.1         294.         1835.                       .43
       AVERAGE            21.0                                    .0*         166.9         874.                      .0819
      STD.DEV.             3.5                                    .0*          73.8         456.                      .0975
  PERCNT:10TH             18.0         4.63                       .0           89.          295.                       .04
          25TH            18.8         6.60         6.95          .0          109.0         486.                      .041
   MEDIAN 50TH            21.5         7.40         7.55          .0          172.5         807.                      .063
          75TH            22.0         7.55         7.65          .0          221.5        1257.                      .072
          90TH            26.0         7.70                       .0          267.         1502.                      .075
SECONDARY CODE

                         06201L       06202L       06301L       20103L       20105L       10602L       10604L       97160S
                       BICARBONT.   BICARBONT.   CARBONATE     CALCIUM      CALCIUM     HARDNESS     HARDNESS     DISCHARGE
                        (CALCD.)     (CALCD.)     (CALCD.)    DISSOLVED    DISSOLVED      TOTAL        TOTAL       INSTANT
                                                                           (CALCD.)     (CALCD.)
                  SUBM   HCO3          HCO3         CO3           CA           CA         CACO3        CACO3
                   ID    MG/L          MG/L         MG/L          MG/L         MG/L         MG/L         MG/L         M3/S
SAMPLES(FLAGS)           16(1)         5(0)        16(1)         13(0)         3(0)        12(0)         4(0)
           LOW            44.          112.          0.           22.          43.4         79.6        129.3
          HIGH           358.          312.         Q0.           51.          54.9        205.6        232.
       AVERAGE           203.*         179.          0.*          37.7         50.1        150.7        188.1
      STD.DEV.            90.*          81.          0.*           9.1          6.0         37.7         43.0
  PERCNT:10TH            108.                        0.           26.                      102.0
          25TH           133.          130.          0.           31.                      126.4        160.1
   MEDIAN 50TH           210.          142.          0.           41.          52.0        158.0        195.5
          75TH           270.          201.          0.           44.                      172.9        216.0
          90TH           325.                        0.           48.9                     195.4
SECONDARY CODE                                           11L 10L

                         11103L       12102L       19103L       09107L       17203L       16306L       26009L       26304L
                         SODIUM      MAGNESIUM    POTASSIUM    FLUORIDE     CHLORIDE     SULPHATE       IRON         IRON
                        DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED      TOTAL      EXTRBLE.

                  SUBM    NA            MG           K             F            CL          SO4           FE           FE
                   ID    MG/L          MG/L         MG/L          MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)           20(0)        16(0)        16(0)         16(1)        16(0)        20(0)         1(0)        15(1)
           LOW             6.5          6.           .8           L.10          4.8          75.          .48         L.01
          HIGH           360.          23.          91.0          1.83        271.          255.          .48         8.10
       AVERAGE            96.7         14.6         20.01         .912*       101.06        147.8                     .976*
      STD.DEV.            88.1          4.7         23.36         .540*       103.55         60.6                    2.108*
  PERCNT:10TH              7.2          7.5          7.5          .34          15.           81.5                      .09
          25TH            25.3         11.0          8.35         .450         20.05         93.5                     .110
   MEDIAN 50TH            78.5         15.0         12.30         .860         54.00        137.0                      .21
          75TH           130.5         17.4         20.60        1.365        221.50        192.5                      .30
          90TH           206.0         20.          60.0         1.77         270.          240.0                     2.80
SECONDARY CODE           11L          11L          11L          06L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE  98                        NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                       INDUSTRIAL MONITORING
STATION 20AL05EB4800    LAT. 53D 43M 20S  LONG. 113D 14M 39S   PR 3   UTM 12 351950E 5954750N  FOR JUN 16, 1980 TO APR 12, 1984
ALBERTA FOOD PRODUCTS LTD FT SASK.        FINAL EFFLUENT GRAB
RIVER LOTS 16 18 20 MD STURGEON 90

                         07105L      07205L      07562L      07021L      07906L       07905L      15421L      97160S
                        NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN     NITROGEN   PHOSPHORUS  DISCHARGE
                        DISSOLVED   DISSOLVED   DISSOLVED    TOTAL     PARTICULATE  PARTICULATE  TOTAL       INSTANT
                        NO3 & NO2   NITRITE     AMMONIA     KJELDAHL     TOTAL       (CALCD.)
                  SUBM     N           N           N           N            N            N           P
                   ID     MG/L        MG/L        MG/L        MG/L         MG/L         MG/L        MG/L        M3/S
SAMPLES(FLAGS)            16(3)       16(7)       18(0)       19(0)        13(0)                    18(0)
           LOW             .026       L.020        .200        .900         .07                      .02
          HIGH            18.20       2.00        19.600      54.00        20.25                    8.550
       AVERAGE             1.363*      .258*       9.298      22.612        2.806                   1.470
      STD.DEV.             4.498*      .490*       6.371      15.959        5.343                   2.398
   PERCNT:10TH            L.05        L.05         .890        4.000        .44                      .045
          25TH              .060*     L.050        3.300      10.500        .790                     .195
   MEDIAN 50TH             .200        .080       10.031      16.600       1.1                       .301
          75TH             .250        .205       14.600      36.000       2.02                     1.900
          90TH            1.070        .63        18.070      50.00        3.60                     6.750
SECONDARY CODE            10L         06L         61L         15L                                06L 19L

                         10474L      10407L      10511L      10453L      14101L       97160S      97163S
                        RESIDUE     RESIDUE     RESIDUE     RESIDUE      SILICA      DISCHARGE   DISCHARGE
                         TOTAL    NONFILTRABLE  VOLATILE   FILTRABLE    REACTIVE      INSTANT      DAILY
                                                NONFILTR.                                          MEAN
                  SUBM                          (CALCD.)                  SIO2
                   ID     MG/L        MG/L        MG/L        MG/L         MG/L         M3/S        CFS
SAMPLES(FLAGS)            16(0)       20(0)       4(0)        19(0)        16(0)                    15(0)
           LOW            210.0        8.0         2.4        153.          2.0                      .024
          HIGH            1252.       522.        110.0       1110.        13.5                      .43
       AVERAGE            704.6        61.0        33.3        568.1        5.37                     .0819
      STD.DEV.            274.7       113.4        51.3        270.4        3.07                     .0975
   PERCNT:10TH            436.         11.0                    158.         2.1                      .04
          25TH            538.0        15.4         5.2        420.         3.35                     .041
   MEDIAN 50TH            662.5        28.5        10.5        530.         4.80                     .063
          75TH            854.0        50.0        61.5        740.0        6.45                     .072
          90TH            1164.       119.0                    950.         9.8                      .075
SECONDARY CODE            71L         01L                     51L          02L

                         00205L      02074L      06537L      06524L      02001L       16101L      10701L      06608L
                         TOTAL     TURBIDITY    PHENOLIC     OIL AND      ODOUR       SULPHIDE    SURFACT.     CYANIDE
                        DISSOLVED               MATERIAL     GREASE     THRESHOLD    DISSOLVED    N-ALKYL
                         SOLIDS                                          NUMBER                   SULPHNTS.
                  SUBM                          PHENOL                                  S           LAS         CN
                   ID     MG/L        NTU         MG/L        MG/L         TON          MG/L        MG/L        MG/L
SAMPLES(FLAGS)            15(0)       1(0)        13(2)       20(2)        13(0)        6(1)                    4(0)
           LOW            207.4       15.0        L.002        0.            1.         L.01                    .006
          HIGH            1049.       15.0         .127        68.1        1000.        2.40                    .261
       AVERAGE            555.7                    .024*       5.760*       106.         .488*                  .0933
      STD.DEV.            209.2                    .034*      15.635*       271.         .940*                  .1160
   PERCNT:10TH            350.                    L.002         .450          4.
          25TH            414.                     .007         .750         10.         .06                    .0165
   MEDIAN 50TH            544.                     .014        1.150         16.         .110                   .0530
          75TH            660.5                    .018        1.950         64.         .24                    .1700
          90TH            820.                     .049       14.100        100.
SECONDARY CODE                                                 21L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE  99                        NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                       INDUSTRIAL MONITORING
STATION 20AL05EB4800    LAT. 53D 43M 20S  LONG. 113D 14M 39S   PR 3   UTM 12 351950E 5954750N  FOR JUN 16, 1980 TO APR 12, 1984
ALBERTA FOOD PRODUCTS LTD FT SASK.         FINAL EFFLUENT GRAB
RIVER LOTS 16 18 20 MD STURGEON 90

                         08304L      08202L      06107L      06154L      06001L      06051L      06006L      06905L
                         OXYGEN      OXYGEN      CARBON      CARBON      CARBON      CARBON      CARBON      CARBON
                          TOTAL      BIOCHEM.    DISSOLVED   DISSOLVED    TOTAL       TOTAL      TOTAL       PARTICULATE
                           COD       DEMAND-BOD  ORGANIC     INORGANIC   ORGANIC     INORGANIC                TOTAL
                  SUBM     02           02       C           C           C           C           C           C
                   ID    MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           19(0)       20(0)       13(0)       13(0)        7(0)        1(0)        1(0)       13(0)
           LOW            18.4         3.6        1.          23.0        10.9       60.         245.           1.49
          HIGH           943.0       542.0      110.0         77.        185.        60.         245.         222.00
       AVERAGE           236.2       130.41      21.65        47.90      110.66                               24.87
      STD.DEV.           263.5       173.49      28.36        15.93       52.91                               59.63
  PERCNT:10TH             38.9         6.90       3.6         26.0                                             1.50
          25TH            55.4        15.15       7.          34.0       100.0                                 5.13
   MEDIAN 50TH           118.4        29.65      17.          47.        110.7                                 6.72
          75TH           440.        209.50      21.          59.4       145.0                                12.50
          90TH           720.0       447.00      38.0         61.                                             26.00
SECONDARY CODE           01L                                             05L 07L

                         24101L      24009L      24302L      80015L      80011L      27009L      27302L      47304L
                        CHROMIUM    CHROMIUM    CHROMIUM     MERCURY     MERCURY     COBALT      COBALT      SILVER
                        HEXAVALENT   TOTAL       EXTRBLE.    TOTAL       TOTAL       TOTAL       EXTRBLE.    EXTRBLE.

                  SUBM   CR          CR          CR          HG          HG          CO          CO          AG
                   ID    MG/L        MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           2(2)        14(1)        1(1)       13(12)                  14(5)        1(1)        1(1)
           LOW           L.001        L.001       L.01        .0001                   L.001       L.001       L.2
          HIGH           L.001         .021       L.01       L.0001                    .01        L.001       L.2
       AVERAGE                         .007*                  .0001*                   .003*
      STD.DEV.                         .005*                  .0000*                   .003*
  PERCNT:10TH                          .003                  L.0001                   L.001
          25TH                         .005                  L.0001                   L.001
   MEDIAN 50TH           L.001         .006                  L.0001                    .003
          75TH                         .008                  L.0001                    .004
          90TH                         .01                   L.0001                    .008
SECONDARY CODE

                         29009L      29305L      28009L      28302L      48009L      48302L      82009L      82302L
                         COPPER      COPPER      NICKEL      NICKEL      CADMIUM     CADMIUM     LEAD        LEAD
                          TOTAL      EXTRBLE.    TOTAL       EXTRBLE.    TOTAL       EXTRBLE.    TOTAL       EXTRBLE.

                  SUBM   CU          CU          NI          NI          CD          CD          PB          PB
                   ID    MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           14(1)        1(0)       14(5)        1(1)       14(12)       1(1)        8(5)        6(3)
           LOW            L.001       .010        L.001       L.001       L.001       L.001       L.003       L.002
          HIGH             .049       .010         .110       L.001       L.01        L.001        .011        .034
       AVERAGE             .013*                   .015*                   .002*                   .004*       .011*
      STD.DEV.             .012*                   .028*                   .002*                   .003*       .013*
  PERCNT:10TH              .003                   L.001                   L.001
          25TH             .006                   L.001                   L.001                   L.003       L.003
   MEDIAN 50TH             .011                    .007                   L.001                   L.003        .005
          75TH             .016                    .014                   L.001                    .005       L.02
          90TH             .023                   L.02                     .004
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0010 -  0012 PAGE 100                     NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB4800    LAT. 53D 43M 20S  LONG. 113D 14M 39S   PR 3   UTM 12 351950E 5954750N  FOR FEB 04, 1981 TO APR 12, 1984
ALBERTA FOOD PRODUCTS LTD FT SASK.        FINAL EFFLUENT GRAB
RIVER LOTS 16 18 20 MD STURGEON 90

                       30009L        30305L        25003L        25304L        23009L        42304L        42009L        51003L
                        ZINC          ZINC        MANGANESE     MANGANESE     VANADIUM     MOLYBDENUM    MOLYBDENUM     ANTIMONY
                       TOTAL         EXTRBLE.       TOTAL        EXTRBLE.       TOTAL        EXTRBLE.       TOTAL         TOTAL

               SUBM      ZN            ZN            MN            MN             V            MO            MO            SB
                ID     MG/L           MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)          14(0)          1(0)         14(0)          1(0)         12(3)                       13(7)
           LOW           .004          .003           .01          7.87          L.002                       L.001
          HIGH           .071          .003         8.450          7.87           .016                       L.02
       AVERAGE           .023                       1.590                         .005*                       .006*
      STD.DEV.           .020                       2.197                         .004*                       .007*
   PERCNT:10TH           .004                        .017                        L.002                       L.001
          25TH           .005                        .155                         .002*                      L.001
    MEDIAN 50TH          .023                       1.225                         .004                        .004
          75TH           .033                       1.680                         .006                        .006
          90TH           .046                       3.510                         .007                        .019
SECONDARY CODE

                       33005L        33104L        34005L        34102L        13111L        13306L        04102L        04304L
                       ARSENIC       ARSENIC      SELENIUM      SELENIUM      ALUMINUM      ALUMINUM     BERYLLIUM      BERYLLIUM
                      TOTAL         DISSOLVED     TOTAL         DISSOLVED     DISSOLVED     EXTRBLE.     DISSOLVED       EXTRBLE.

               SUBM      AS            AS            SE            SE            AL            AL            BE            BE
                ID     MG/L          MG/L          MG/L          MG/L          UG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)          7(0)                        7(7)                                     12(0)                       12(12)
           LOW          .0004                      L.0002                                      .069                        L.001
          HIGH          .0054                      L.0002                                    19.620                        L.001
       AVERAGE          .0029                                                                 2.890
      STD.DEV.          .0022                                                                 5.657
   PERCNT:10TH                                                                                 .116                        L.001
          25TH          .0006                      L.0002                                      .143                        L.001
    MEDIAN 50TH         .0034                      L.0002                                      .307                        L.001
          75TH          .0051                      L.0002                                     3.255                        L.001
          90TH                                                                                6.360                        L.001
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE 101                  NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                 INDUSTRIAL MONITORING
STATION 20AL05EB4801    LAT. 53D 43M 20S  LONG. 113D 14M 39S   PR 3   UTM 12 351950E 5954750N  FOR NOV 04, 1980 TO SEP 22, 1982
ALBERTA FOOD PRODUCTS LTD FT SASK          FINAL EFFLUENT COMP
RIVER LOTS 16 18 20 MD STURGEON 90

                        02061F      10301L      10301F      10151L      10101L      02041L      97160S      97163S
                        TEMPERATURE PH          PH          ALKALINITY  ALKALINITY  SPECIFIC    DISCHARGE   DISCHARGE
                        OF WATER                            PHENOL      TOTAL       CONDUCT.    INSTANT     DAILY
                                                            PHTHALEIN                                       MEAN
                  SUBM                                      CACO3       CACO3
                  ID    DEG.C       PH UNITS    PH UNITS    MG/L        MG/L        US/CM       M3/S        CFS
    SAMPLES(FLAGS)                  5(0)        1(0)        3(0)        3(0)        5(0)                    3(0)
               LOW                  4.60        8.2         .0          181.        268.                    .04
              HIGH                  7.8         8.2         .0          214.        1347.                   .074
           AVERAGE                                          .0          201.0       704.                    .0620
          STD.DEV.                                          .0          17.6        439.                    .0191
       PERCNT:10TH
              25TH                  4.61                                            315.
       MEDIAN 50TH                  7.6                     .0          208.        782.                    .072
              75TH                  7.6                                             807.
              90TH
    SECONDARY CODE

                        06201L      06202L      06301L      20103L      20105L      10602L      10604L      97160S
                        BICARBONT.  BICARBONT.  CARBONATE   CALCIUM     CALCIUM     HARDNESS    HARDNESS    DISCHARGE
                        (CALCD.)    (CALCD.)    (CALCD.)    DISSOLVED   DISSOLVED   TOTAL       TOTAL       INSTANT
                                                                        (CALCD.)    (CALCD.)
                  SUBM  HCO3        HCO3        CO3         CA          CA          CACO3       CACO3
                  ID    MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        M3/S
    SAMPLES(FLAGS)      3(0)                    3(0)        2(0)        1(0)        2(0)        1(0)
               LOW      221.                    0.          42.         50.1        166.6       216.
              HIGH      261.                    0.          45.         50.1        170.0       216.
           AVERAGE      245.                    0.          43.5                    168.3
          STD.DEV.      21.                     0.          2.1                     2.4
       PERCNT:10TH
              25TH
       MEDIAN 50TH      254.                    0.          43.5                    168.3
              75TH
              90TH
    SECONDARY CODE
                                                            10L
                        11103L      12102L      19103L      09107L      17203L      16306L      26009L      26304L
                        SODIUM      MAGNESIUM   POTASSIUM   FLUORIDE    CHLORIDE    SULPHATE    IRON        IRON
                        DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED   TOTAL       EXTRBLE.
                  SUBM  NA          MG          K           F           CL          SO4         FE          FE
                  ID    MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
    SAMPLES(FLAGS)      5(0)        3(0)        3(0)        3(0)        3(0)        5(0)                    3(0)
               LOW      7.8         14.         8.5         .32         42.         70.                     .13
              HIGH      152.        22.         12.9        1.77        234.        130.0                   .17
           AVERAGE      60.3        17.0        10.03       .897        112.33      98.6                    .150
          STD.DEV.      58.7        4.4         2.48        .769        105.79      21.7                    .020
       PERCNT:10TH
              25TH      9.9                                                         93.
       MEDIAN 50TH      66.         15.         8.7         .60         61.         95.                     .15
              75TH      66.                                                         105.0
              90TH
    SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE 102                   NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB4801    LAT. 53D 43M 20S  LONG. 113D 14M 39S   PR 3   UTM 12 351950E 5954750N  FOR NOV 04, 1980 TO SEP 22, 1982
ALBERTA FOOD PRODUCTS LTD FT SASK         FINAL EFFLUENT COMP
RIVER LOTS 16 18 20 MD STURGEON 90

                        07105L        07205L        07562L        07021L        07906L        07905L        15421L        97160S
                        NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN      PHOSPHORUS    DISCHARGE
                        DISSOLVED     DISSOLVED     DISSOLVED     TOTAL         PARTICULATE   PARTICULATE   TOTAL          INSTANT
                        NO3 & NO2     NITRITE       AMMONIA       KJELDAHL      TOTAL         (CALCD.)
                   SUBM N             N             N             N             N             N             P
                   ID   MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          M3/S
    SAMPLES(FLAGS)      3(0)          3(0)          4(0)          4(0)          3(0)                        4(0)
               LOW      .10           .07           4.10          17.0          .91                         .095
              HIGH      .90           .85           17.380        50.00         2.7                         2.350
           AVERAGE      .383          .347          12.352        26.844        1.573                       1.115
          STD.DEV.      .448          .437          5.999         15.529        .981                        1.077
       PERCNT:10TH
              25TH                                  7.950         18.125                                    .218
       MEDIAN 50TH      .15           .12           13.965        20.188        1.11                        1.008
              75TH                                  16.755        35.563                                    2.012
              90TH
    SECONDARY CODE                                  61L           15L                                       06L 19L

                        10474L        10407L        10511L        10453L        14101L        97160S        97163S
                        RESIDUE       RESIDUE       RESIDUE       RESIDUE       SILICA        DISCHARGE     DISCHARGE
                        TOTAL         NONFILTRABLE  VOLATILE      FILTRABLE     REACTIVE       INSTANT      DAILY
                                                    NONFILTR.                                               MEAN
                   SUBM                             (CALCD.)                    SIO2
                   ID   MG/L          MG/L          MG/L          MG/L          MG/L          M3/S          CFS
    SAMPLES(FLAGS)      3(0)          5(0)          2(0)          5(0)          3(0)                        3(0)
               LOW      420.          10.           14.4          162.          3.8                         .04
              HIGH      873.          44.           27.0          830.          8.2                         .074
           AVERAGE      598.0         22.7          20.7          416.6         5.40                        .0620
          STD.DEV.      241.6         15.4          8.9           270.2         2.43                        .0191
       PERCNT:10TH
              25TH                    11.                         191.
       MEDIAN 50TH      501.          14.4          20.7          410.          4.2                         .072
              75TH                    34.0                        490.
              90TH
    SECONDARY CODE                    01L                         51L           02L

                        00205L        02074L        06537L        06524L        02001L        16101L        10701L        06608L
                        TOTAL         TURBIDITY     PHENOLIC      OIL AND       ODOUR         SULPHIDE      SURFACT.       CYANIDE
                        DISSOLVED                   MATERIAL      GREASE        THRESHOLD     DISSOLVED     N-ALKYL
                        SOLIDS                                                  NUMBER                      SULPHNTS.
                   SUBM                             PHENOL                                    S             LAS           CN
                   ID   MG/L          NTU           MG/L          MG/L          TON           MG/L          MG/L          MG/L
    SAMPLES(FLAGS)      3(0)                        3(0)          5(0)          4(0)
               LOW      369.                        .003          .5            10.
              HIGH      674.                        .015          3.            32.
           AVERAGE      488.3                       .011          1.640         21.
          STD.DEV.      163.0                       .007          .929          13.
       PERCNT:10TH
              25TH                                                1.3           10.
       MEDIAN 50TH      422.                        .014          1.4           21.
              75TH                                                2.            32.
              90TH
    SECONDARY CODE                                                21L
```

```
REQUEST 0007 -  0009 PAGE 103                        NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                       INDUSTRIAL MONITORING
STATION 20AL05EB4801    LAT. 53D 43M 20S  LONG. 113D 14M 39S   PR 3   UTM 12 351950E 5954750N  FOR NOV 04, 1980 TO SEP 22, 1982
ALBERTA FOOD PRODUCTS LTD FT SASK             FINAL EFFLUENT COMP
RIVER LOTS 16 18 20 MD STURGEON 90

                         08304L      08202L       06107L       06154L       06001L       06051L       06006L       06905L
                         OXYGEN      OXYGEN       CARBON       CARBON       CARBON       CARBON       CARBON       CARBON
                          TOTAL      BIOCHEM.     DISSOLVED    DISSOLVED     TOTAL        TOTAL       TOTAL        PARTICULATE
                           COD       DEMAND-BOD   ORGANIC      INORGANIC    ORGANIC      INORGANIC                  TOTAL
                   SUBM  02             02        C            C            C            C            C            C
                    ID   MG/L         MG/L        MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)            4(0)         5(0)        3(0)         3(0)         2(0)                                   3(0)
           LOW            57.5         10.9        8.           53.          110.0                                   4.38
          HIGH           390.         214.0        19.          57.          133.0                                  16.
       AVERAGE           148.1         89.68       14.67        55.33        121.50                                  8.70
      STD.DEV.           161.5        102.50        5.86         2.08         16.26                                  6.36
   PERCNT:10TH
          25TH            62.0         16.0
   MEDIAN 50TH            72.5         18.5        17.          56.          121.50                                  5.71
          75TH           234.3        189.0
          90TH
SECONDARY CODE                                                              05L

                         24101L       24009L       24302L       80015L       80011L       27009L       27302L       47304L
                         CHROMIUM     CHROMIUM     CHROMIUM     MERCURY      MERCURY      COBALT       COBALT       SILVER
                         HEXAVALENT   TOTAL         EXTRBLE.    TOTAL        TOTAL        TOTAL        EXTRBLE.     EXTRBLE.

                   SUBM   CR           CR           CR           HG           HG           CO           CO           AG
                    ID   MG/L         MG/L         MG/L         MG/L         UG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)                         2(0)                      2(2)                      2(0)
           LOW                          .008                     L.0001                     .003
          HIGH                          .009                     L.0001                     .003
       AVERAGE                          .009                                                .003
      STD.DEV.                          .001                                                .000
   PERCNT:10TH
          25TH
   MEDIAN 50TH                          .009                     L.0001                     .003
          75TH
          90TH
SECONDARY CODE

                         29009L       29305L       28009L       28302L       48009L       48302L       82009L       82302L
                         COPPER       COPPER       NICKEL       NICKEL       CADMIUM      CADMIUM      LEAD         LEAD
                          TOTAL       EXTRBLE.     TOTAL        EXTRBLE.      TOTAL       EXTRBLE.      TOTAL       EXTRBLE.

                   SUBM   CU           CU           NI           NI           CD           CD           PB           PB
                    ID   MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)            2(0)                      2(0)                      2(2)                      2(2)
           LOW             .012                      .011                     L.001                     L.003
          HIGH             .017                      .013                     L.001                     L.003
       AVERAGE             .015                      .012
      STD.DEV.             .004                      .001
   PERCNT:10TH
          25TH
   MEDIAN 50TH             .015                      .012                     L.001                     L.003
          75TH
          90TH
SECONDARY CODE
```

```
REQUEST 0010 -  0012 PAGE 104                      NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                    INDUSTRIAL MONITORING
STATION 20AL05EB4801    LAT. 53D 43M 20S  LONG. 113D 14M 39S   PR 3   UTM 12 351950E 5954750N  FOR SEP 21, 1982 TO SEP 22, 1982
ALBERTA FOOD PRODUCTS LTD FT SASK          FINAL EFFLUENT COMP
RIVER LOTS 16 18 20 MD STURGEON 90

                              30009L     30305L     25003L     25304L     23009L     42304L     42009L     51003L
                               ZINC       ZINC     MANGANESE  MANGANESE  VANADIUM  MOLYBDENUM MOLYBDENUM  ANTIMONY
                               TOTAL    EXTRBLE.     TOTAL    EXTRBLE.     TOTAL    EXTRBLE.     TOTAL      TOTAL

                    SUBM        ZN         ZN         MN         MN          V         MO         MO         SB
                     ID        MG/L       MG/L       MG/L       MG/L       MG/L       MG/L       MG/L       MG/L
SAMPLES(FLAGS)                 2(0)                  2(0)                  2(0)                  2(2)
           LOW                  .077                 1.480                  .003                 L.001
          HIGH                  .104                 1.570                  .003                 L.001
       AVERAGE                  .091                 1.525                  .003
      STD.DEV.                  .019                  .064                  .000
  PERCNT:10TH
          25TH
  MEDIAN  50TH                  .091                 1.525                  .003                 L.001
          75TH
          90TH
SECONDARY CODE

                              33005L     33104L     34005L     34102L     13111L     13306L     04102L     04304L
                              ARSENIC    ARSENIC   SELENIUM   SELENIUM   ALUMINUM   ALUMINUM  BERYLLIUM  BERYLLIUM
                               TOTAL    DISSOLVED   TOTAL    DISSOLVED  DISSOLVED  EXTRBLE.  DISSOLVED   EXTRBLE.

                    SUBM        AS         AS         SE         SE         AL         AL         BE         BE
                     ID        MG/L       MG/L       MG/L       MG/L       UG/L       MG/L       MG/L       MG/L
SAMPLES(FLAGS)                                                                         2(0)                  2(2)
           LOW                                                                          .026                 L.001
          HIGH                                                                          .073                 L.001
       AVERAGE                                                                          .050
      STD.DEV.                                                                          .033
  PERCNT:10TH
          25TH
  MEDIAN  50TH                                                                          .050                 L.001
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE 105                     NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB4803    LAT. 53D 43M 20S  LONG. 113D 14M 39S   PR 3   UTM 12 351950E 5954750N  FOR OCT 06, 1983 TO OCT 06, 1983
ALBERTA FOOD PRODUCTS LTD. FT SASK.       INLET TO WATER TREATMENT PLAN GRAB

                       02061F        10301L        10301F        10151L        10101L        02041L        97160S        97163S
                    TEMPERATURE        PH            PH        ALKALINITY    ALKALINITY     SPECIFIC     DISCHARGE      DISCHARGE
                    OF WATER                                     PHENOL         TOTAL       CONDUCT.       INSTANT        DAILY
                                                                PHTHALEIN                                                 MEAN
               SUBM                                              CACO3          CACO3
                ID     DEG.C        PH UNITS      PH UNITS         MG/L        MG/L          US/CM          M3/S           CFS
SAMPLES(FLAGS)           1(0)          1(0)                        1(0)        1(0)           1(0)
           LOW            28.0          6.5                           .0        270.           1012.
          HIGH            28.0          6.5                           .0        270.           1012.
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE

                       06201L        06202L        06301L        20103L        20105L        10602L        10604L        97160S
                     BICARBONT.    BICARBONT.     CARBONATE     CALCIUM        CALCIUM      HARDNESS      HARDNESS     DISCHARGE
                       (CALCD.)     (CALCD.)      (CALCD.)     DISSOLVED     DISSOLVED         TOTAL         TOTAL        INSTANT
                                                                             (CALCD.)       (CALCD.)
               SUBM    HCO3          HCO3           CO3            CA           CA            CACO3         CACO3
                ID   MG/L            MG/L           MG/L           MG/L         MG/L          MG/L          MG/L         M3/S
SAMPLES(FLAGS)           1(0)          1(0)         1(0)           1(0)                        1(0)
           LOW            329.          329.           0.           7.                          50.4
          HIGH            329.          329.           0.           7.                          50.4
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE                                                   10L
                       11103L        12102L        19103L        09107L        17203L        16306L        26009L        26304L
                       SODIUM      MAGNESIUM     POTASSIUM      FLUORIDE      CHLORIDE       SULPHATE      IRON           IRON
                      DISSOLVED    DISSOLVED     DISSOLVED      DISSOLVED     DISSOLVED     DISSOLVED      TOTAL         EXTRBLE.

               SUBM      NA            MG            K             F             CL            SO4           FE            FE
                ID      MG/L         MG/L         MG/L           MG/L          MG/L           MG/L          MG/L         MG/L
SAMPLES(FLAGS)           1(0)          1(0)         1(0)          1(0)          1(0)          1(0)                         1(0)
           LOW           189.           8.          17.0           .98          69.           135.                        6.50
          HIGH           189.           8.          17.0           .98          69.           135.                        6.50
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE 106                      NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                     INDUSTRIAL MONITORING
STATION 20AL05EB4803    LAT. 53D 43M 20S  LONG. 113D 14M 39S   PR 3   UTM 12 351950E 5954750N  FOR OCT 06, 1983 TO OCT 06, 1983
ALBERTA FOOD PRODUCTS LTD. FT SASK.       INLET TO WATER TREATMENT PLAN GRAB

                       07105L        07205L        07562L        07021L        07906L        07905L        15421L        97160S
                      NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN     PHOSPHORUS    DISCHARGE
                      DISSOLVED     DISSOLVED     DISSOLVED      TOTAL      PARTICULATE   PARTICULATE     TOTAL        INSTANT
                      NO3 & NO2     NITRITE       AMMONIA       KJELDAHL       TOTAL        (CALCD.)
                 SUBM     N             N             N             N             N             N             P
                  ID     MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          M3/S
SAMPLES(FLAGS)           1(1)          1(1)          1(0)          1(0)          1(0)                        1(0)
           LOW           L.05          L.05          3.660         22.000        5.55                        31.000
          HIGH           L.05          L.05          3.660         22.000        5.55                        31.000
       AVERAGE
      STD.DEV.
  PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE

                       10474L        10407L        10511L        10453L        14101L        97160S        97163S
                       RESIDUE       RESIDUE       RESIDUE       RESIDUE       SILICA       DISCHARGE     DISCHARGE
                        TOTAL      NONFILTRABLE   VOLATILE      FILTRABLE     REACTIVE       INSTANT        DAILY
                                                  NONFILTR.                                                 MEAN
                 SUBM                             (CALCD.)                      SIO2
                  ID     MG/L          MG/L          MG/L          MG/L          MG/L          M3/S          CFS
SAMPLES(FLAGS)           1(0)          1(0)                        1(0)          1(0)
           LOW           1751.         941.                        810.          8.3
          HIGH           1751.         941.                        810.          8.3
       AVERAGE
      STD.DEV.
  PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE                                                                   02L

                       00205L        02074L        06537L        06524L        02001L        16101L        10701L        06608L
                        TOTAL       TURBIDITY      PHENOLIC      OIL AND        ODOUR       SULPHIDE      SURFACT.       CYANIDE
                      DISSOLVED                    MATERIAL      GREASE       THRESHOLD     DISSOLVED      N-ALKYL
                       SOLIDS                                                   NUMBER                    SULPHNTS.
                 SUBM                              PHENOL                                       S             LAS           CN
                  ID     MG/L          NTU          MG/L          MG/L          TON           MG/L          MG/L          MG/L
SAMPLES(FLAGS)           1(0)                        1(0)          1(0)
           LOW           587.                        .351          438.5
          HIGH           587.                        .351          438.5
       AVERAGE
      STD.DEV.
  PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE 107                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB4803    LAT. 53D 43M 20S  LONG. 113D 14M 39S   PR 3   UTM 12 351950E 5954750N  FOR OCT 06, 1983 TO OCT 06, 1983
ALBERTA FOOD PRODUCTS LTD. FT SASK.        INLET TO WATER TREATMENT PLAN GRAB

                        08304L      08202L      06107L      06154L      06001L      06051L      06006L      06905L
                        OXYGEN      OXYGEN      CARBON      CARBON      CARBON      CARBON      CARBON      CARBON
                         TOTAL      BIOCHEM.    DISSOLVED   DISSOLVED    TOTAL       TOTAL      TOTAL       PARTICULATE
                          COD       DEMAND-BOD  ORGANIC     INORGANIC   ORGANIC     INORGANIC                TOTAL
                 SUBM     02            02        C           C           C           C           C           C
                  ID    MG/L         MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           1(0)         1(0)        1(0)        1(0)                                            1(0)
           LOW         2966.5       1680.0       452.0        50.9                                          207.90
          HIGH         2966.5       1680.0       452.0        50.9                                          207.90
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE

                        24101L      24009L      24302L      80015L      80011L      27009L      27302L      47304L
                       CHROMIUM    CHROMIUM    CHROMIUM    MERCURY     MERCURY     COBALT      COBALT      SILVER
                      HEXAVALENT    TOTAL       EXTRBLE.    TOTAL       TOTAL       TOTAL      EXTRBLE.    EXTRBLE.

                 SUBM     CR          CR          CR          HG          HG          CO          CO          AG
                  ID    MG/L         MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)                        1(0)                    1(1)                    1(0)
           LOW                        .012                  L.0001                    .005
          HIGH                        .012                  L.0001                    .005
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE

                        29009L      29305L      28009L      28302L      48009L      48302L      82009L      82302L
                        COPPER      COPPER      NICKEL      NICKEL     CADMIUM     CADMIUM      LEAD        LEAD
                         TOTAL      EXTRBLE.    TOTAL       EXTRBLE.    TOTAL      EXTRBLE.     TOTAL      EXTRBLE.

                 SUBM     CU          CU          NI          NI          CD          CD          PB          PB
                  ID    MG/L         MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           1(0)                     1(0)                    1(1)                                1(0)
           LOW           .067                     .012                  L.001                                 .035
          HIGH           .067                     .012                  L.001                                 .035
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
```

```
                                              NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                INDUSTRIAL MONITORING
STATION 20AL05EB4803    LAT. 53D 43M 20S  LONG. 113D 14M 39S   PR 3   UTM 12 351950E 5954750N  FOR OCT 06, 1983 TO OCT 06, 1983
ALBERTA FOOD PRODUCTS LTD. FT SASK.        INLET TO WATER TREATMENT PLAN GRAB

                       30009L      30305L      25003L      25304L      23009L      42304L      42009L      51003L
                        ZINC        ZINC      MANGANESE   MANGANESE   VANADIUM   MOLYBDENUM  MOLYBDENUM   ANTIMONY
                       TOTAL      EXTRBLE.     TOTAL      EXTRBLE.     TOTAL      EXTRBLE.     TOTAL       TOTAL

               SUBM     ZN          ZN          MN          MN          V           MO          MO          SB
                ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)          1(0)                    1(0)                    1(0)                    1(0)
           LOW          .082                   3.650                    .006                    .009
          HIGH          .082                   3.650                    .006                    .009
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE

                       33005L      33104L      34005L      34102L      13111L      13306L      04102L      04304L
                       ARSENIC     ARSENIC    SELENIUM    SELENIUM    ALUMINUM    ALUMINUM   BERYLLIUM   BERYLLIUM
                       TOTAL      DISSOLVED   TOTAL       DISSOLVED   DISSOLVED   EXTRBLE.   DISSOLVED    EXTRBLE.

               SUBM     AS          AS          SE          SE          AL          AL          BE          BE
                ID     MG/L        MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)          1(0)                    1(1)                                1(0)                    1(1)
           LOW          .0064                  L.0002                              1.530                   L.001
          HIGH          .0064                  L.0002                              1.530                   L.001
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE 109                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                  INDUSTRIAL MONITORING
STATION 20AL05EB5500    LAT. 53D 43M 11S  LONG. 113D 10M 44S   PR 3   UTM 12 356250E 5954300N  FOR APR 28, 1980 TO APR 28, 1980
JOHNS MANVILLE CANADA INC. FT SASK.        FINAL EFFLUENT GRAB
53 T55 R22 W4M

                         02061F       10301L       10301F       10151L       10101L       02041L       97160S       97163S
                       TEMPERATURE      PH           PH       ALKALINITY   ALKALINITY    SPECIFIC    DISCHARGE    DISCHARGE
                        OF WATER                                PHENOL        TOTAL      CONDUCT.     INSTANT       DAILY
                                                              PHTHALEIN                                              MEAN
                  SUBM                                          CACO3        CACO3
                   ID    DEG.C       PH UNITS     PH UNITS      MG/L         MG/L         US/CM        M3/S          CFS
SAMPLES(FLAGS)            1(0)         1(0)                      1(0)         1(0)         1(0)
           LOW            16.0          8.1                       .0          122.         462.
          HIGH            16.0          8.1                       .0          122.         462.
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE

                         06201L       06202L       06301L       20103L       20105L       10602L       10604L       97160S
                       BICARBONT.   BICARBONT.   CARBONATE     CALCIUM      CALCIUM     HARDNESS     HARDNESS    DISCHARGE
                         (CALCD.)     (CALCD.)     (CALCD.)    DISSOLVED    DISSOLVED      TOTAL        TOTAL       INSTANT
                                                                             (CALCD.)     (CALCD.)
                  SUBM   HCO3          HCO3         CO3           CA           CA          CACO3        CACO3
                   ID   MG/L          MG/L         MG/L          MG/L         MG/L         MG/L         MG/L         M3/S
SAMPLES(FLAGS)            1(0)                      1(0)                      1(0)                      1(0)
           LOW            149.                        0.                       38.0                     161.
          HIGH            149.                        0.                       38.0                     161.
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE

                         11103L       12102L       19103L       09107L       17203L       16306L       26009L       26304L
                         SODIUM     MAGNESIUM    POTASSIUM     FLUORIDE     CHLORIDE     SULPHATE       IRON         IRON
                       DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED      TOTAL      EXTRBLE.

                  SUBM    NA           MG            K            F            CL          SO4           FE           FE
                   ID    MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)            1(0)         1(0)         1(0)         1(0)         1(0)         1(0)                      1(0)
           LOW            22.          16.          4.3          .98          20.          78.                       .16
          HIGH            22.          16.          4.3          .98          20.          78.                       .16
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE 110                          NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                          INDUSTRIAL MONITORING
STATION 20AL05EB5500    LAT. 53D 43M 11S  LONG. 113D 10M 44S   PR 3   UTM 12 356250E 5954300N  FOR APR 28, 1980 TO APR 28, 1980
JOHNS MANVILLE CANADA INC. FT SASK.       FINAL EFFLUENT GRAB
S3 T55 R22 W4M

                     07105L      07205L      07562L      07021L      07906L       07905L       15421L      97160S
                    NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN     NITROGEN    PHOSPHORUS  DISCHARGE
                    DISSOLVED   DISSOLVED   DISSOLVED     TOTAL    PARTICULATE  PARTICULATE    TOTAL       INSTANT
                    NO3 & NO2    NITRITE    AMMONIA     KJELDAHL     TOTAL       (CALCD.)
              SUBM     N            N           N           N           N            N            P
               ID     MG/L        MG/L        MG/L        MG/L        MG/L         MG/L         MG/L        M3/S
SAMPLES(FLAGS)        1(0)        1(0)        1(0)        1(0)                                  1(0)
           LOW         .55         .08       1.680      11.290                                 1.694
          HIGH         .55         .08       1.680      11.290                                 1.694
       AVERAGE
      STD.DEV.
  PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE                               61L         15L                                    19L

                     10474L      10407L      10511L      10453L      14101L      97160S       97163S
                     RESIDUE     RESIDUE     RESIDUE     RESIDUE     SILICA     DISCHARGE    DISCHARGE
                      TOTAL   NONFILTRABLE  VOLATILE   FILTRABLE    REACTIVE     INSTANT       DAILY
                                            NONFILTR.                                          MEAN
              SUBM                          (CALCD.)                  SIO2
               ID     MG/L        MG/L        MG/L        MG/L        MG/L        M3/S          CFS
SAMPLES(FLAGS)        1(0)        1(0)                                1(0)
           LOW        397.          7.                                 4.8
          HIGH        397.          7.                                 4.8
       AVERAGE
      STD.DEV.
  PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE                                                        02L

                     00205L      02074L      06537L      06524L      02001L      16101L       10701L      06608L
                      TOTAL     TURBIDITY    PHENOLIC    OIL AND      ODOUR      SULPHIDE     SURFACT.     CYANIDE
                    DISSOLVED                MATERIAL    GREASE     THRESHOLD   DISSOLVED     N-ALKYL
                     SOLIDS                                          NUMBER                  SULPHNTS.
              SUBM                            PHENOL                                 S          LAS          CN
               ID     MG/L        NTU         MG/L        MG/L        TON         MG/L         MG/L        MG/L
SAMPLES(FLAGS)        1(0)        1(0)        1(0)        1(0)                                  1(0)
           LOW        254.         5.4        .014         1.1                                   .82
          HIGH        254.         5.4        .014         1.1                                   .82
       AVERAGE
      STD.DEV.
  PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE                    73L
```

```
REQUEST 0007 -  0009 PAGE 111                      NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                     INDUSTRIAL MONITORING
STATION 20AL05EB5500    LAT. 53D 43M 11S  LONG. 113D 10M 44S   PR 3   UTM 12 356250E 5954300N  FOR APR 28, 1980 TO APR 28, 1980
JOHNS MANVILLE CANADA INC. FT SASK.       FINAL EFFLUENT GRAB
S3 T55 R22 W4M

                       08304L       08202L       06107L       06154L       06001L       06051L       06006L       06905L
                       OXYGEN       OXYGEN       CARBON       CARBON       CARBON       CARBON       CARBON       CARBON
                        TOTAL      BIOCHEM.    DISSOLVED    DISSOLVED      TOTAL        TOTAL      TOTAL      PARTICULATE
                         COD      DEMAND-BOD    ORGANIC     INORGANIC     ORGANIC     INORGANIC                  TOTAL
                 SUBM   O2            O2          C            C            C            C            C            C
                  ID    MG/L        MG/L        MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)           1(0)                                               1(0)         1(0)         1(0)
           LOW            68.0                                              14.          26.          40.
          HIGH            68.0                                              14.          26.          40.
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
  MEDIAN  50TH
          75TH
          90TH
SECONDARY CODE

                       24101L       24009L       24302L       80015L       80011L       27009L       27302L       47304L
                      CHROMIUM     CHROMIUM     CHROMIUM     MERCURY      MERCURY      COBALT       COBALT       SILVER
                     HEXAVALENT     TOTAL        EXTRBLE.     TOTAL        TOTAL        TOTAL       EXTRBLE.     EXTRBLE.

                 SUBM   CR           CR           CR           HG           HG           CO           CO           AG
                  ID    MG/L         MG/L         MG/L         MG/L         UG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)           1(1)         1(0)                      1(1)                      1(0)
           LOW           L.001         .008                    L.0001                      .011
          HIGH           L.001         .008                    L.0001                      .011
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
  MEDIAN  50TH
          75TH
          90TH
SECONDARY CODE

                       29009L       29305L       28009L       28302L       48009L       48302L       82009L       82302L
                       COPPER       COPPER       NICKEL       NICKEL      CADMIUM      CADMIUM       LEAD         LEAD
                        TOTAL       EXTRBLE.     TOTAL        EXTRBLE.     TOTAL       EXTRBLE.      TOTAL       EXTRBLE.

                 SUBM   CU           CU           NI           NI           CD           CD           PB           PB
                  ID    MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)           1(0)                      1(0)                      1(1)                                   1(1)
           LOW            .011                     .235                     L.001                                  L.003
          HIGH            .011                     .235                     L.001                                  L.003
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
  MEDIAN  50TH
          75TH
          90TH
SECONDARY CODE
```

```
REQUEST 0010 -  0012 PAGE 112                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB5500    LAT. 53D 43M 11S  LONG. 113D 10M 44S   PR 3   UTM 12 356250E 5954300N  FOR APR 28, 1980 TO APR 28, 1980
JOHNS MANVILLE CANADA INC. FT SASK.        FINAL EFFLUENT GRAB
S3 T55 R22 W4M

                         30009L      30305L      25003L      25304L      23009L      42304L      42009L      51003L
                          ZINC        ZINC     MANGANESE   MANGANESE   VANADIUM   MOLYBDENUM  MOLYBDENUM  ANTIMONY
                         TOTAL     EXTRBLE.      TOTAL     EXTRBLE.      TOTAL     EXTRBLE.     TOTAL       TOTAL

                 SUBM     ZN          ZN          MN          MN          V           MO          MO          SB
                  ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           1(0)                    1(0)
           LOW            .109                    .105
          HIGH            .109                    .105
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE 113                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB5603    LAT. 53D 43M 16S  LONG. 113D 10M 45S   PR 3   UTM 12 356200E 5954500N  FOR APR 06, 1983 TO APR 06, 1983
LIQUID CARBONIC CANADA LTD. FT.SASK.      POND SEEPAGE     - GRAB
SE S3 T55 R22 W4M

                          02061F      10301L      10301F      10151L      10101L      02041L      97160S      97163S
                        TEMPERATURE     PH          PH      ALKALINITY  ALKALINITY   SPECIFIC   DISCHARGE   DISCHARGE
                        OF WATER                             PHENOL       TOTAL      CONDUCT.    INSTANT      DAILY
                                                            PHTHALEIN                                          MEAN
                    SUBM                                      CACO3       CACO3
                     ID   DEG.C       PH UNITS    PH UNITS    MG/L        MG/L        US/CM       M3/S         CFS
SAMPLES(FLAGS)             1(0)        1(0)                   1(0)        1(0)        1(0)
           LOW              6.0        11.9                   57.5        562.        1710.
          HIGH              6.0        11.9                   57.5        562.        1710.
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE

                          06201L      06202L      06301L      20103L      20105L      10602L      10604L      97160S
                        BICARBONT.  BICARBONT.  CARBONATE    CALCIUM     CALCIUM    HARDNESS    HARDNESS   DISCHARGE
                         (CALCD.)    (CALCD.)    (CALCD.)   DISSOLVED   DISSOLVED     TOTAL       TOTAL     INSTANT
                                                                         (CALCD.)    (CALCD.)
                    SUBM  HCO3        HCO3        CO3         CA          CA          CACO3       CACO3
                     ID  MG/L         MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        M3/S
SAMPLES(FLAGS)             1(0)                   1(0)        1(0)                    1(1)
           LOW             545.                    69.        275.                   Q690.8
          HIGH             545.                    69.        275.                   Q690.8
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE                                                10L

                          11103L      12102L      19103L      09107L      17203L      16306L      26009L      26304L
                          SODIUM     MAGNESIUM   POTASSIUM   FLUORIDE    CHLORIDE    SULPHATE      IRON        IRON
                        DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED     TOTAL      EXTRBLE.

                    SUBM   NA          MG          K           F           CL          SO4         FE          FE
                     ID   MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)             1(0)        1(1)        1(0)        1(0)        1(0)        1(0)                    1(0)
           LOW              14.         L0.         4.4         .34         79.        240.                     .31
          HIGH              14.         L0.         4.4         .34         79.        240.                     .31
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
```

```
REQUEST 0004 -  0006 PAGE 114                         NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                        INDUSTRIAL MONITORING
STATION 20AL05EB5603    LAT. 53D 43M 16S  LONG. 113D 10M 45S   PR 3   UTM 12 356200E 5954500N  FOR APR 06, 1983 TO APR 06, 1983
LIQUID CARBONIC CANADA LTD. FT.SASK.       POND SEEPAGE     - GRAB
SE S3 T55 R22 W4M

                         07105L       07205L       07562L       07021L       07906L       07905L       15421L       97160S
                        NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN    PHOSPHORUS   DISCHARGE
                        DISSOLVED    DISSOLVED    DISSOLVED     TOTAL      PARTICULATE  PARTICULATE    TOTAL       INSTANT
                 SUBM   NO3 & NO2     NITRITE     AMMONIA      KJELDAHL       TOTAL       (CALCD.)
                  ID        N            N           N            N             N            N            P
SAMPLES(FLAGS)            MG/L         MG/L        MG/L         MG/L          MG/L         MG/L         MG/L          M3/S
           LOW             1(0)         1(0)        1(0)         1(0)          1(1)                      1(0)
          HIGH            10.00          .80       21.300       37.500         L.01                       .130
       AVERAGE            10.00          .80       21.300       37.500         L.01                       .130
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE

                         10474L       10407L       10511L       10453L       14101L       97160S       97163S
                         RESIDUE      RESIDUE      RESIDUE      RESIDUE      SILICA      DISCHARGE    DISCHARGE
                          TOTAL     NONFILTRABLE   VOLATILE    FILTRABLE    REACTIVE      INSTANT       DAILY
                                                  NONFILTR.                                              MEAN
                 SUBM                              (CALCD.)                   SIO2
                  ID      MG/L         MG/L         MG/L         MG/L         MG/L         M3/S          CFS
SAMPLES(FLAGS)             1(0)         1(0)                      1(0)         1(0)
           LOW            1303.         33.                      1270.         2.5
          HIGH            1303.         33.                      1270.         2.5
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
                                                                              02L
                         00205L       02074L       06537L       06524L       02001L       16101L       10701L       06608L
                          TOTAL      TURBIDITY    PHENOLIC     OIL AND       ODOUR       SULPHIDE     SURFACT.      CYANIDE
                        DISSOLVED                 MATERIAL     GREASE      THRESHOLD    DISSOLVED     N-ALKYL
                          SOLIDS                                             NUMBER                  SULPHNTS.
                 SUBM                              PHENOL                                  S            LAS          CN
                  ID      MG/L         NTU          MG/L         MG/L          TON         MG/L         MG/L         MG/L
SAMPLES(FLAGS)             1(0)         1(0)        1(0)         1(0)                                   1(0)
           LOW            1016.          4.5        .041          .6                                     .47
          HIGH            1016.          4.5        .041          .6                                     .47
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE 115                         NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                        INDUSTRIAL MONITORING
STATION 20AL05EB5603    LAT. 53D 43M 16S  LONG. 113D 10M 45S   PR 3   UTM 12 356200E 5954500N  FOR APR 06, 1983 TO APR 06, 1983
LIQUID CARBONIC CANADA LTD. FT.SASK.      POND SEEPAGE      - GRAB
SE S3 T55 R22 W4M
                         08304L       08202L       06107L       06154L       06001L       06051L       06006L       06905L
                         OXYGEN       OXYGEN       CARBON       CARBON       CARBON       CARBON       CARBON       CARBON
                           TOTAL      BIOCHEM.     DISSOLVED    DISSOLVED      TOTAL        TOTAL      TOTAL      PARTICULATE
                           COD       DEMAND-BOD     ORGANIC     INORGANIC     ORGANIC     INORGANIC                  TOTAL
                 SUBM      02           02           C            C            C            C            C            C
                  ID     MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)             1(0)                      1(0)         1(0)                                               1(0)
           LOW             106.7                     31.0         6.5                                                 2.20
          HIGH             106.7                     31.0         6.5                                                 2.20
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
                         24101L       24009L       24302L       80015L       80011L       27009L       27302L       47304L
                         CHROMIUM     CHROMIUM     CHROMIUM     MERCURY      MERCURY      COBALT       COBALT       SILVER
                        HEXAVALENT     TOTAL        EXTRBLE.     TOTAL        TOTAL        TOTAL       EXTRBLE.     EXTRBLE.

                 SUBM      CR           CR           CR           HG           HG           CD           CO           AG
                  ID     MG/L         MG/L         MG/L         MG/L         UG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)             1(1)         1(0)                      1(0)                      1(0)
           LOW             L.001         .012                     .0002                      .011
          HIGH             L.001         .012                     .0002                      .011
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
                         29009L       29305L       28009L       28302L       48009L       48302L       82009L       82302L
                         COPPER       COPPER       NICKEL       NICKEL       CADMIUM      CADMIUM      LEAD         LEAD
                         TOTAL        EXTRBLE.     TOTAL        EXTRBLE.     TOTAL        EXTRBLE.     TOTAL        EXTRBLE.

                 SUBM      CU           CU           NI           NI           CD           CD           PB           PB
                  ID     MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)             1(0)                      1(0)                      1(0)                      1(1)
           LOW              .009                      .062                      .003                     L.003
          HIGH              .009                      .062                      .003                     L.003
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
```

```
REQUEST 0010 -  0012 PAGE 116                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                  INDUSTRIAL MONITORING
STATION 20AL05EB5603    LAT. 53D 43M 16S  LONG. 113D 10M 45S   PR 3   UTM 12 356200E 5954500N  FOR APR 06, 1983 TO APR 06, 1983
LIQUID CARBONIC CANADA LTD. FT.SASK.      POND SEEPAGE     - GRAB
SE S3 T55 R22 W4M

                           30009L     30305L     25003L     25304L     23009L     42304L     42009L     51003L
                            ZINC       ZINC     MANGANESE  MANGANESE  VANADIUM  MOLYBDENUM MOLYBDENUM  ANTIMONY
                           TOTAL     EXTRBLE.    TOTAL     EXTRBLE.    TOTAL     EXTRBLE.    TOTAL      TOTAL

                    SUBM     ZN         ZN         MN         MN         V          MO         MO         SB
                     ID     MG/L       MG/L       MG/L       MG/L       MG/L       MG/L       MG/L       MG/L
SAMPLES(FLAGS)              1(0)                  1(0)                  1(0)                  1(0)
           LOW                .002                  .017                  .011                  .008
          HIGH                .002                  .017                  .011                  .008
       AVERAGE
      STD.DEV.
  PERCNT:10TH
          25TH
  MEDIAN  50TH
          75TH
          90TH
SECONDARY CODE

                           33005L     33104L     34005L     34102L     13111L     13306L     04102L     04304L
                           ARSENIC    ARSENIC   SELENIUM   SELENIUM   ALUMINUM   ALUMINUM  BERYLLIUM  BERYLLIUM
                           TOTAL     DISSOLVED  TOTAL      DISSOLVED  DISSOLVED  EXTRBLE.  DISSOLVED   EXTRBLE.

                    SUBM     AS         AS         SE         SE         AL         AL         BE         BE
                     ID     MG/L       MG/L       MG/L       MG/L       UG/L       MG/L       MG/L       MG/L
SAMPLES(FLAGS)                                                                      1(0)                  1(1)
           LOW                                                                        .060                L.001
          HIGH                                                                        .060                L.001
       AVERAGE
      STD.DEV.
  PERCNT:10TH
          25TH
  MEDIAN  50TH
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE 117                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                  INDUSTRIAL MONITORING
STATION 20AL05EB5604    LAT. 53D 43M 16S  LONG. 113D 10M 45S   PR 3   UTM 12 356200E 5954500N  FOR APR 19, 1983 TO MAY 03, 1983
LIQUID CARBONIC CANADA LTD. FT.SASK.      POND SAMPLE      - GRAB

                      02061F      10301L      10301F      10151L      10101L      02041L      97160S      97163S
                    TEMPERATURE     PH          PH      ALKALINITY  ALKALINITY   SPECIFIC   DISCHARGE   DISCHARGE
                    OF WATER                             PHENOL       TOTAL      CONDUCT.    INSTANT      DAILY
                                                       PHTHALEIN                                          MEAN
                SUBM                                     CACO3       CACO3
                 ID   DEG.C      PH UNITS    PH UNITS    MG/L        MG/L        US/CM       M3/S         CFS
SAMPLES(FLAGS)          2(0)       2(0)                   2(0)        2(0)        2(0)
           LOW           4.5       12.0                   35.0        599.        2630.
          HIGH           7.5       12.3                   190.        1550.       3370.
       AVERAGE           6.0                              112.5       1074.5      3000.
      STD.DEV.           2.1                              109.6        672.5       523.
  PERCNT:10TH
          25TH
   MEDIAN 50TH           6.0       12.15                  112.5       1074.5      3000.
          75TH
          90TH
SECONDARY CODE

                      06201L      06202L      06301L      20103L      20105L      10602L      10604L      97160S
                    BICARBONT.  BICARBONT.  CARBONATE    CALCIUM     CALCIUM    HARDNESS    HARDNESS    DISCHARGE
                     (CALCD.)    (CALCD.)   (CALCD.)    DISSOLVED   DISSOLVED    TOTAL       TOTAL       INSTANT
                                                                     (CALCD.)    (CALCD.)
                SUBM  HCO3        HCO3        CO3          CA          CA        CACO3       CACO3
                 ID  MG/L         MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        M3/S
SAMPLES(FLAGS)          2(0)                   2(0)       2(0)                    2(2)
           LOW          645.                    42.       235.                    Q590.9
          HIGH          1426.                  228.       690.                    Q1727.0
       AVERAGE          1036.                  135.       462.5
      STD.DEV.          553.                   132.       321.7
  PERCNT:10TH
          25TH
   MEDIAN 50TH          1036.                  135.       462.5                   1159.0
          75TH
          90TH
SECONDARY CODE                                          10L

                      11103L      12102L      19103L      09107L      17203L      16306L      26009L      26304L
                      SODIUM     MAGNESIUM   POTASSIUM   FLUORIDE    CHLORIDE    SULPHATE      IRON        IRON
                     DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED     TOTAL      EXTRBLE.

                SUBM   NA          MG          K           F           CL          SO4         FE          FE
                 ID   MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)         2(0)        2(2)        2(0)        2(0)        2(0)        2(0)                    2(0)
           LOW          2.         L0.          .8         .34         34.         35.                     .08
          HIGH         11.         L0.         2.9         .68         180.        205.                    .09
       AVERAGE          6.5                    1.85        .510        107.00      120.0                   .085
      STD.DEV.          6.4                    1.48        .240        103.24      120.2                   .007
  PERCNT:10TH
          25TH
   MEDIAN 50TH          6.5        L1.0        1.85        .510        107.00      120.0                   .085
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE 118                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB5604    LAT. 53D 43M 16S  LONG. 113D 10M 45S   PR 3   UTM 12 356200E 5954500N  FOR APR 19, 1983 TO MAY 03, 1983
LIQUID CARBONIC CANADA LTD. FT.SASK.      POND SAMPLE      - GRAB

                       07105L      07205L      07562L      07021L      07906L      07905L      15421L      97160S
                      NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN   PHOSPHORUS   DISCHARGE
                      DISSOLVED   DISSOLVED   DISSOLVED    TOTAL    PARTICULATE PARTICULATE   TOTAL        INSTANT
                      NO3 & NO2   NITRITE     AMMONIA     KJELDAHL     TOTAL      (CALCD.)
                SUBM      N           N           N           N           N           N           P
                 ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        M3/S
SAMPLES(FLAGS)           2(0)        2(0)        2(0)        2(0)        2(1)                    2(0)
           LOW            .40         .25       7.900      19.000        L.01                    .200
          HIGH           2.90         .66       8.930      49.000        1.00                    .400
       AVERAGE          1.650        .455       8.415      34.000        .505*                   .300
      STD.DEV.          1.768        .290        .728      21.213        .700*                   .141
  PERCNT:10TH
          25TH
  MEDIAN  50TH          1.650        .455       8.415      34.000        .505*                   .300
          75TH
          90TH
SECONDARY CODE

                       10474L      10407L      10511L      10453L      14101L      97160S      97163S
                       RESIDUE     RESIDUE     RESIDUE     RESIDUE     SILICA     DISCHARGE   DISCHARGE
                        TOTAL   NONFILTRABLE  VOLATILE    FILTRABLE   REACTIVE     INSTANT      DAILY
                                              NONFILTR.                                         MEAN
                SUBM                          (CALCD.)                  SIO2
                 ID    MG/L        MG/L        MG/L        MG/L        MG/L        M3/S         CFS
SAMPLES(FLAGS)           2(0)        2(0)                    2(0)        2(0)
           LOW           818.          5.                    810.          .6
          HIGH          2645.          8.                   2640.         1.0
       AVERAGE         1731.5         6.5                  1725.0         .80
      STD.DEV.         1291.9         2.1                  1294.0         .28
  PERCNT:10TH
          25TH
  MEDIAN  50TH         1731.5         6.5                  1725.0         .80
          75TH
          90TH
SECONDARY CODE                                                         02L

                       00205L      02074L      06537L      06524L      02001L      16101L      10701L      06608L
                        TOTAL     TURBIDITY    PHENOLIC    OIL AND      ODOUR     SULPHIDE    SURFACT.     CYANIDE
                      DISSOLVED                MATERIAL    GREASE     THRESHOLD   DISSOLVED   N-ALKYL
                       SOLIDS                                          NUMBER                 SULPHNTS.
                SUBM                           PHENOL                                  S         LAS          CN
                 ID    MG/L        NTU         MG/L        MG/L         TON         MG/L        MG/L        MG/L
SAMPLES(FLAGS)           2(0)        2(0)      2(0)        2(0)                                  2(0)
           LOW           669.          .9       .031          .3                                  .23
          HIGH          2032.         5.0       .069          .4                                  .70
       AVERAGE         1350.5         3.0       .050        .350                                 .465
      STD.DEV.          963.8         2.9       .027        .071                                 .332
  PERCNT:10TH
          25TH
  MEDIAN  50TH         1350.5         3.0       .050        .350                                 .465
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE 119                        NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                       INDUSTRIAL MONITORING
STATION 20AL05EB5604    LAT. 53D 43M 16S  LONG. 113D 10M 45S   PR 3   UTM 12 356200E 5954500N  FOR APR 19, 1983 TO MAY 03, 1983
LIQUID CARBONIC CANADA LTD. FT.SASK.        POND SAMPLE       - GRAB

                         08304L       08202L       06107L       06154L       06001L       06051L       06006L       06905L
                         OXYGEN       OXYGEN       CARBON       CARBON       CARBON       CARBON       CARBON       CARBON
                          TOTAL       BIOCHEM.     DISSOLVED    DISSOLVED     TOTAL        TOTAL       TOTAL       PARTICULATE
                           COD        DEMAND-BOD   ORGANIC      INORGANIC    ORGANIC      INORGANIC                 TOTAL
                 SUBM      02             02          C            C            C            C            C            C
                  ID     MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)            2(0)                      2(0)         2(0)                                                2(0)
           LOW            37.2                       9.2          2.1                                                 .08
          HIGH           126.1                      22.0         15.0                                                1.40
       AVERAGE            81.6                      15.60         8.55                                                .74
      STD.DEV.            62.9                       9.05         9.12                                                .93
  PERCNT:10TH
          25TH
   MEDIAN 50TH            81.6                      15.60         8.55                                                .74
          75TH
          90TH
SECONDARY CODE

                         24101L       24009L       24302L       80015L       80011L       27009L       27302L       47304L
                        CHROMIUM     CHROMIUM     CHROMIUM     MERCURY      MERCURY      COBALT       COBALT       SILVER
                       HEXAVALENT     TOTAL        EXTRBLE.     TOTAL        TOTAL        TOTAL       EXTRBLE.     EXTRBLE.

                 SUBM      CR           CR           CR           HG           HG           CO           CO           AG
                  ID     MG/L         MG/L         MG/L         MG/L         UG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)            2(2)         2(0)                      2(1)                      2(0)
           LOW           L.001         .008                     L.0001                     .005
          HIGH           L.001         .014                      .0002                     .007
       AVERAGE                         .011                      .0001*                    .006
      STD.DEV.                         .004                      .0001*                    .001
  PERCNT:10TH
          25TH
   MEDIAN 50TH           L.001         .011                      .0001*                    .006
          75TH
          90TH
SECONDARY CODE

                         29009L       29305L       28009L       28302L       48009L       48302L       82009L       82302L
                         COPPER       COPPER       NICKEL       NICKEL       CADMIUM      CADMIUM      LEAD         LEAD
                          TOTAL       EXTRBLE.     TOTAL        EXTRBLE.     TOTAL        EXTRBLE.     TOTAL       EXTRBLE.

                 SUBM      CU           CU           NI           NI           CD           CD           PB           PB
                  ID     MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)            2(0)                      2(0)                      2(1)                      1(1)         1(1)
           LOW            .005                      .016                     L.001                     L.003        L.003
          HIGH            .006                      .018                      .002                     L.003        L.003
       AVERAGE            .006                      .017                      .001*
      STD.DEV.            .001                      .001                      .001*
  PERCNT:10TH
          25TH
   MEDIAN 50TH            .006                      .017                      .001*
          75TH
          90TH
SECONDARY CODE
```

```
REQUEST 0010 -  0012 PAGE 120                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB5604    LAT. 53D 43M 16S  LONG. 113D 10M 45S   PR 3   UTM 12 356200E 5954500N  FOR APR 19, 1983 TO MAY 03, 1983
LIQUID CARBONIC CANADA LTD. FT.SASK.      POND SAMPLE      - GRAB

                         30009L       30305L      25003L      25304L      23009L      42304L      42009L      51003L
                          ZINC         ZINC      MANGANESE   MANGANESE   VANADIUM   MOLYBDENUM  MOLYBDENUM   ANTIMONY
                         TOTAL       EXTRBLE.     TOTAL      EXTRBLE.     TOTAL      EXTRBLE.     TOTAL       TOTAL

                SUBM      ZN           ZN          MN          MN           V           MO          MO          SB
                 ID      MG/L         MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           2(0)                     2(2)                    2(0)                    2(1)
           LOW            .014                    L.008                    .008                   L.001
          HIGH            .015                    L.008                    .008                    .006
       AVERAGE            .015                                             .008                    .003*
      STD.DEV.            .001                                             .000                    .004*
   PERCNT:10TH
          25TH
   MEDIAN 50TH            .015                    L.008                    .008                    .003*
          75TH
          90TH
SECONDARY CODE

                         33005L       33104L      34005L      34102L      13111L      13306L      04102L      04304L
                         ARSENIC      ARSENIC     SELENIUM    SELENIUM    ALUMINUM    ALUMINUM   BERYLLIUM   BERYLLIUM
                        TOTAL       DISSOLVED   TOTAL       DISSOLVED   DISSOLVED    EXTRBLE.   DISSOLVED    EXTRBLE.

                SUBM      AS           AS          SE          SE          AL          AL          BE          BE
                 ID      MG/L         MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)                                                                        2(0)                    2(2)
           LOW                                                                         .025                   L.001
          HIGH                                                                         .045                   L.001
       AVERAGE                                                                         .035
      STD.DEV.                                                                         .014
   PERCNT:10TH
          25TH
   MEDIAN 50TH                                                                         .035                   L.001
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE 121                         NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                        INDUSTRIAL MONITORING
STATION 20AL05EB5700    LAT. 53D 43M 14S  LONG. 113D 10M 55S   PR 3   UTM 12 356050E 5954400N  FOR AUG 19, 1980 TO JUL 18, 1984
CANADIAN INDUSTRIES LTD.                  INDUSTRIAL CHEMICALS FORT SASKATCHEWAN
FINAL EFFLUENT GRAB

                        02061F         10301L         10301F         10151L         10101L         02041L         97160S         97163S
                        TEMPERATURE    PH             PH             ALKALINITY     ALKALINITY     SPECIFIC       DISCHARGE      DISCHARGE
                        OF WATER                                     PHENOL         TOTAL          CONDUCT.       INSTANT        DAILY
                                                                     PHTHALEIN                                                   MEAN
                 SUBM                                                CACO3          CACO3
                   ID   DEG.C          PH UNITS       PH UNITS       MG/L           MG/L           US/CM          M3/S           CFS
  SAMPLES(FLAGS)        7(0)           11(0)          1(0)           11(0)          8(0)           11(0)                         5(0)
             LOW        11.0           6.23           8.5            .0             38.0           250.                          .060
            HIGH        25.5           8.9            8.5            15.0           149.           1411.                         .15
         AVERAGE        17.1                                         1.4            99.2           576.                          .0960
        STD.DEV.        4.7                                          4.5            36.2           359.                          .0336
     PERCNT:10TH                       6.80                          .0                            271.
            25TH        14.5           7.23                          .0             75.7           280.                          .08
     MEDIAN 50TH        16.0           7.92                          .0             99.0           482.                          .09
            75TH        21.0           8.2                           .0             128.5          690.                          .1
            90TH                       8.40                          0.                            995.
  SECONDARY CODE

                        06201L         06202L         06301L         20103L         20105L         10602L         10604L         97160S
                        BICARBONT.     BICARBONT.     CARBONATE      CALCIUM        CALCIUM        HARDNESS       HARDNESS       DISCHARGE
                        (CALCD.)       (CALCD.)       (CALCD.)       DISSOLVED      DISSOLVED      TOTAL          TOTAL          INSTANT
                                                                                    (CALCD.)       (CALCD.)
                 SUBM   HCO3           HCO3           CO3            CA             CA             CACO3          CACO3
                   ID   MG/L           MG/L           MG/L           MG/L           MG/L           MG/L           MG/L           M3/S
  SAMPLES(FLAGS)        8(0)           4(0)           8(0)           8(0)           2(0)           8(0)
             LOW        46.            46.            0.             28.0           27.9           112.1
            HIGH        160.           125.           18.            101.0          100.7          392.2
         AVERAGE        116.           87.            2.             51.0           64.3           199.4
        STD.DEV.        38.            34.            6.             24.6           51.5           103.6
     PERCNT:10TH
            25TH        92.            61.            0.             32.5                          119.8
     MEDIAN 50TH        121.           88.            0.             44.5           64.3           162.6
            75TH        149.           113.           0.             62.5                          263.1
            90TH
  SECONDARY CODE                                                     10L

                        11103L         12102L         19103L         09107L         17203L         16306L         26009L         26304L
                        SODIUM         MAGNESIUM      POTASSIUM      FLUORIDE       CHLORIDE       SULPHATE       IRON           IRON
                        DISSOLVED      DISSOLVED      DISSOLVED      DISSOLVED      DISSOLVED      DISSOLVED      TOTAL          EXTRBLE.

                 SUBM   NA             MG             K              F              CL             SO4            FE             FE
                   ID   MG/L           MG/L           MG/L           MG/L           MG/L           MG/L           MG/L           MG/L
  SAMPLES(FLAGS)        8(0)           8(0)           8(0)           8(0)           8(0)           8(0)           3(1)           8(1)
             LOW        2.0            6.             .80            .38            3.             55.            L.01           L.020
            HIGH        155.0          35.            4.10           1.05           15.            640.0          1.41           3.510
         AVERAGE        53.6           17.5           2.39           .780           7.50           200.4          .573*          .985*
        STD.DEV.        50.6           10.9           1.51           .232           4.57           203.1          .739*          1.154*
     PERCNT:10TH
            25TH        13.5           11.0           .95            .620           3.50           69.0                          .230
     MEDIAN 50TH        47.0           13.0           2.35           .810           6.00           125.0          .30            .675
            75TH        75.5           25.5           3.80           .975           11.50          260.0                         1.270
            90TH
  SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE 122                              NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                              INDUSTRIAL MONITORING
STATION 20AL05EB5700    LAT. 53D 43M 14S  LONG. 113D 10M 55S   PR 3   UTM 12 356050E 5954400N  FOR AUG 19, 1980 TO JUL 18, 1984
CANADIAN INDUSTRIES LTD.                          INDUSTRIAL CHEMICALS FORT SASKATCHEWAN
FINAL EFFLUENT GRAB

                            07105L       07205L       07562L       07021L       07906L       07905L       15421L       97160S
                           NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN    PHOSPHORUS   DISCHARGE
                           DISSOLVED    DISSOLVED    DISSOLVED     TOTAL     PARTICULATE  PARTICULATE    TOTAL       INSTANT
                           NO3 & NO2     NITRITE      AMMONIA     KJELDAHL      TOTAL       (CALCD.)
                    SUBM       N            N            N            N            N            N            P
                     ID      MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         M3/S
SAMPLES(FLAGS)              11(0)        11(7)        11(0)        11(0)         8(1)                     11(1)
           LOW                .05         L.02         .316         .600         L.01                      .008
          HIGH               5.70          .60        1.750        2.500          .71                     1.100
       AVERAGE              1.093         .106*        .979        1.538         .211*                     .411*
      STD.DEV.              1.685         .168*        .480         .698         .231*                     .351*
  PERCNT:10TH                 .06         L.02          .60         .740                                  L.016
          25TH                .08         L.02         .650         .900         .080                      .048
   MEDIAN 50TH                .50         L.05         .790        1.320         .125                      .480
          75TH               1.15          .10          1.5          2.2         .280                      .640
          90TH              2.460          .15        1.690        2.200                                   .760
SECONDARY CODE                                         61L          15L                                    19L

                            10474L       10407L       10511L       10453L       14101L       97160S       97163S
                           RESIDUE      RESIDUE      RESIDUE      RESIDUE      SILICA      DISCHARGE    DISCHARGE
                            TOTAL    NONFILTRABLE   VOLATILE    FILTRABLE    REACTIVE      INSTANT       DAILY
                                                   NONFILTR.                                              MEAN
                    SUBM                            (CALCD.)                   SIO2
                     ID      MG/L         MG/L         MG/L         MG/L         MG/L         M3/S          CFS
SAMPLES(FLAGS)              11(0)        11(0)                       8(0)         8(0)                      5(0)
           LOW              204.0           2.                      200.0          2.9                      .060
          HIGH             1288.0         48.0                     1240.0        12.40                       .15
       AVERAGE              508.5         21.9                      520.0         6.53                     .0960
      STD.DEV.              321.9         18.0                      343.1         3.41                     .0336
  PERCNT:10TH                248.           3.
          25TH               253.          4.0                      300.0         3.70                       .08
   MEDIAN 50TH               402.          18.                      425.0         5.70                       .09
          75TH               708.          47.                      635.0         9.05                        .1
          90TH               823.          48.
SECONDARY CODE               71L          01L                                     02L

                            00205L       02074L       06537L       06524L       02001L       16101L       10701L       06608L
                            TOTAL      TURBIDITY     PHENOLIC     OIL AND      ODOUR       SULPHIDE     SURFACT.      CYANIDE
                          DISSOLVED                  MATERIAL     GREASE     THRESHOLD    DISSOLVED     N-ALKYL
                            SOLIDS                                            NUMBER                   SULPHNTS.
                    SUBM                              PHENOL                                   S           LAS          CN
                     ID      MG/L          NTU         MG/L         MG/L          TON         MG/L         MG/L         MG/L
SAMPLES(FLAGS)               8(0)         6(0)        10(3)        11(3)                                   2(1)
           LOW              149.1          1.0        L.002        L.200                                   L.05
          HIGH              978.7         15.0         .030          7.0                                    .31
       AVERAGE              398.5          6.4         .007*       1.330*                                  .180*
      STD.DEV.              284.1          5.7         .009*       1.948*                                  .184*
  PERCNT:10TH                                         L.002         .330
          25TH              199.0          3.0        L.002           .4
   MEDIAN 50TH              308.0          3.7         .004           .7                                   .180*
          75TH              523.0         12.0         .010          1.1
          90TH                                         .020          2.0
SECONDARY CODE                                                       21L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE 123                        NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                       INDUSTRIAL MONITORING
STATION 20AL05EB5700    LAT. 53D 43M 14S  LONG. 113D 10M 55S   PR 3   UTM 12 356050E 5954400N  FOR AUG 19, 1980 TO JUL 18, 1984
CANADIAN INDUSTRIES LTD.                     INDUSTRIAL CHEMICALS FORT SASKATCHEWAN
FINAL EFFLUENT GRAB

                        08304L       08202L       06107L       06154L       06001L       06051L       06006L       06905L
                        OXYGEN       OXYGEN       CARBON       CARBON       CARBON       CARBON       CARBON       CARBON
                         TOTAL      BIOCHEM.    DISSOLVED    DISSOLVED      TOTAL        TOTAL      TOTAL      PARTICULATE
                          COD      DEMAND-BOD    ORGANIC     INORGANIC     ORGANIC     INORGANIC                  TOTAL
                 SUBM     02           02           C            C            C            C            C            C
                  ID     MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)           11(1)                     8(0)         8(0)         3(1)                                   8(1)
           LOW            L5.0                      .5          15.20        L1.0                                    L.01
          HIGH            25.4                     6.0          34.3          6.6                                    3.83
       AVERAGE            15.1*                    2.66         24.32         4.67*                                  1.46*
      STD.DEV.             7.7*                    1.64          8.06         3.18*                                  1.34*
   PERCNT:10TH             6.5
          25TH             7.1                     1.55         17.55                                                 .40
   MEDIAN 50TH            15.                      2.80         22.00         6.4                                    1.15
          75TH            23.                      3.05         33.00                                                2.38
          90TH            24.5
SECONDARY CODE           01L                                               07L

                        24101L       24009L       24302L       80015L       80011L       27009L       27302L       47304L
                       CHROMIUM     CHROMIUM     CHROMIUM      MERCURY      MERCURY      COBALT       COBALT       SILVER
                      HEXAVALENT     TOTAL        EXTRBLE.      TOTAL        TOTAL        TOTAL       EXTRBLE.     EXTRBLE.

                 SUBM     CR           CR           CR           HG           HG           CO           CO           AG
                  ID     MG/L         MG/L         MG/L         MG/L         UG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)            7(7)        11(2)                      8(8)                     11(4)                     3(2)
           LOW           L.001         .005                     L.0001                    L.001                     L.02
          HIGH           L.001         .066                     L.0001                     .02                       .02
       AVERAGE                         .020*                                               .007*                     .020*
      STD.DEV.                         .022*                                               .006*                     .000*
   PERCNT:10TH                         .009                                               L.001
          25TH           L.001         .009                     L.0001                     .003
   MEDIAN 50TH           L.001         .01                      L.0001                     .007                     L.02
          75TH           L.001         .020                     L.0001                    L.01
          90TH                         .062                                                .012
SECONDARY CODE

                        29009L       29305L       28009L       28302L       48009L       48302L       82009L       82302L
                        COPPER       COPPER       NICKEL       NICKEL       CADMIUM      CADMIUM       LEAD         LEAD
                         TOTAL       EXTRBLE.      TOTAL       EXTRBLE.      TOTAL       EXTRBLE.      TOTAL       EXTRBLE.

                 SUBM     CU           CU           NI           NI           CD           CD           PB           PB
                  ID     MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)           11(0)                     11(4)                     11(9)                      4(2)         7(3)
           LOW            .001                     L.001                     L.001                     L.003        L.003
          HIGH            .062                      .17                      L.01                       .027         .019
       AVERAGE            .018                      .052*                     .004*                     .009*        .009*
      STD.DEV.            .019                      .060*                     .004*                     .012*        .005*
   PERCNT:10TH            .004                     L.001                     L.001
          25TH            .005                      .010                     L.001                     L.003         .004
   MEDIAN 50TH            .013                     L.02                      L.001                      .004*       L.01
          75TH            .017                      .104                     L.01                       .016         .01
          90TH            .049                      .145                     L.01
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0010 -  0012 PAGE 124                          NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                         INDUSTRIAL MONITORING
STATION 20AL05EB5700    LAT. 53D 43M 14S  LONG. 113D 10M 55S   PR 3   UTM 12 356050E 5954400N  FOR AUG 19, 1980 TO JUL 18, 1984
CANADIAN INDUSTRIES LTD.                        INDUSTRIAL CHEMICALS FORT SASKATCHEWAN
FINAL EFFLUENT GRAB

                         30009L      30305L      25003L      25304L      23009L      42304L      42009L      51003L
                          ZINC        ZINC      MANGANESE   MANGANESE   VANADIUM   MOLYBDENUM  MOLYBDENUM   ANTIMONY
                          TOTAL      EXTRBLE.     TOTAL      EXTRBLE.     TOTAL      EXTRBLE.     TOTAL       TOTAL

                 SUBM      ZN          ZN          MN          MN          V           MO          MO          SB
                  ID      MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            11(1)                   11(1)                   7(1)                    10(8)
           LOW             L.001                    .005                  L.002                    L.001
          HIGH              .11                     .678                   .011                    L.02
       AVERAGE              .036*                   .100*                  .005*                    .008*
      STD.DEV.              .034*                   .195*                  .003*                    .009*
  PERCNT:10TH               .006                   L.008                                           L.001
          25TH              .01                     .008                   .003                    L.001
   MEDIAN 50TH              .022                    .043                   .004                     .002*
          75TH              .060                    .093                   .008                    L.02
          90TH              .076                    .105                                           L.020
SECONDARY CODE

                         33005L      33104L      34005L      34102L      13111L      13306L      04102L      04304L
                         ARSENIC     ARSENIC     SELENIUM    SELENIUM    ALUMINUM    ALUMINUM   BERYLLIUM   BERYLLIUM
                         TOTAL      DISSOLVED    TOTAL      DISSOLVED   DISSOLVED    EXTRBLE.   DISSOLVED    EXTRBLE.

                 SUBM      AS          AS          SE          SE          AL          AL          BE          BE
                  ID      MG/L        MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            3(0)                    2(2)                                8(0)                    7(7)
           LOW            .0003                   L.0002                               .280                   L.001
          HIGH            .0400                   L.0002                              2.050                   L.001
       AVERAGE            .0147                                                        .902
      STD.DEV.            .0220                                                        .585
  PERCNT:10TH
          25TH                                                                         .465                   L.001
   MEDIAN 50TH            .0037                   L.0002                               .753                   L.001
          75TH                                                                        1.225                   L.001
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE 125                         NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                          INDUSTRIAL MONITORING
STATION 20AL05EB5701    LAT. 53D 43M 16S  LONG. 113D 10M 46S   PR 3   UTM 12 356200E 5954500N  FOR JUL 17, 1984 TO JUL 17, 1984
CANADIAN INDUSTRIES LTD.                         INDUSTRIAL CHEMICALS FORT SASKATCHEWAN
FINAL EFFLUENT COMPOSITE

                          02061F        10301L       10301F       10151L       10101L       02041L       97160S        97163S
                        TEMPERATURE       PH           PH      ALKALINITY   ALKALINITY    SPECIFIC    DISCHARGE     DISCHARGE
                         OF WATER                                PHENOL        TOTAL      CONDUCT.     INSTANT        DAILY
                 SUBM                                          PHTHALEIN                                                MEAN
                  ID      DEG.C       PH UNITS     PH UNITS      CACO3        CACO3
SAMPLES(FLAGS)                          1(0)                     MG/L         MG/L        US/CM        M3/S          CFS
           LOW                           9.30                     1(0)         1(0)        1(0)                       1(0)
          HIGH                           9.30                      24.2        125.6        869.                       .1
       AVERAGE                                                     24.2        125.6        869.                       .1
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE

                          06201L        06202L       06301L       20103L       20105L       10602L       10604L        97160S
                        BICARBONT.    BICARBONT.    CARBONATE     CALCIUM      CALCIUM     HARDNESS     HARDNESS      DISCHARGE
                         (CALCD.)      (CALCD.)     (CALCD.)     DISSOLVED    DISSOLVED      TOTAL        TOTAL        INSTANT
                 SUBM                                                         (CALCD.)     (CALCD.)
                  ID      HCO3          HCO3          CO3           CA           CA          CACO3        CACO3
SAMPLES(FLAGS)           MG/L           MG/L         MG/L          MG/L         MG/L         MG/L         MG/L          M3/S
           LOW              1(0)         1(0)         1(0)          1(0)         1(0)         1(0)
          HIGH                94.          95.          29.          47.0         46.9        207.9
       AVERAGE                94.          95.          29.          47.0         46.9        207.9
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
                                                           10L
                          11103L        12102L       19103L       09107L       17203L       16306L       26009L        26304L
                          SODIUM      MAGNESIUM    POTASSIUM     FLUORIDE     CHLORIDE     SULPHATE       IRON          IRON
                        DISSOLVED     DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED      TOTAL        EXTRBLE.

                 SUBM      NA            MG            K            F            CL           SO4          FE            FE
                  ID      MG/L          MG/L         MG/L         MG/L         MG/L         MG/L         MG/L          MG/L
SAMPLES(FLAGS)            1(0)          1(0)         1(0)         1(0)         1(0)         1(0)                       1(0)
           LOW            105.0         22.0         1.90         .540         9.00        296.0                        .530
          HIGH            105.0         22.0         1.90         .540         9.00        296.0                        .530
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE 126                     NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                    INDUSTRIAL MONITORING
STATION 20AL05EB5701    LAT. 53D 43M 16S  LONG. 113D 10M 46S   PR 3   UTM 12 356200E 5954500N  FOR JUL 17, 1984 TO JUL 17, 1984
CANADIAN INDUSTRIES LTD.                INDUSTRIAL CHEMICALS FORT SASKATCHEWAN
FINAL EFFLUENT COMPOSITE

                   07105L      07205L      07562L      07021L      07906L      07905L      15421L      97160S
                  NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN   PHOSPHORUS  DISCHARGE
                  DISSOLVED   DISSOLVED   DISSOLVED    TOTAL    PARTICULATE PARTICULATE   TOTAL       INSTANT
                  NO3 & NO2    NITRITE     AMMONIA    KJELDAHL     TOTAL      (CALCD.)
             SUBM     N           N           N           N           N           N           P
              ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L         M3/S
SAMPLES(FLAGS)       1(0)        1(0)        1(0)        1(0)        1(0)                    1(0)
           LOW       6.900        .200       1.400       1.900        .280                   1.040
          HIGH       6.900        .200       1.400       1.900        .280                   1.040
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE

                   10474L      10407L      10511L      10453L      14101L      97160S      97163S
                   RESIDUE     RESIDUE     RESIDUE     RESIDUE     SILICA    DISCHARGE   DISCHARGE
                    TOTAL   NONFILTRABLE  VOLATILE   FILTRABLE    REACTIVE     INSTANT      DAILY
                                         NONFILTR.                                          MEAN
             SUBM                        (CALCD.)                  SIO2
              ID    MG/L        MG/L        MG/L        MG/L        MG/L        M3/S         CFS
SAMPLES(FLAGS)       1(0)        1(0)                    1(0)        1(0)                    1(0)
           LOW       686.0        26.0                   660.0        7.50                    .1
          HIGH       686.0        26.0                   660.0        7.50                    .1
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE                                                     02L

                   00205L      02074L      06537L      06524L      02001L      16101L      10701L      06608L
                    TOTAL     TURBIDITY    PHENOLIC    OIL AND      ODOUR     SULPHIDE    SURFACT.     CYANIDE
                  DISSOLVED                MATERIAL    GREASE     THRESHOLD   DISSOLVED    N-ALKYL
                   SOLIDS                                          NUMBER                 SULPHNTS.
             SUBM                           PHENOL                                 S          LAS          CN
              ID     MG/L        NTU         MG/L        MG/L         TON        MG/L        MG/L         MG/L
SAMPLES(FLAGS)       1(0)        1(0)        1(0)        1(0)
           LOW       586.8        20.0        .006        .800
          HIGH       586.8        20.0        .006        .800
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
```

```
REQUEST 0007 -  0009 PAGE 127                          NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                          INDUSTRIAL MONITORING
STATION 20AL05EB5701    LAT. 53D 43M 16S  LONG. 113D 10M 46S   PR 3   UTM 12 356200E 5954500N  FOR JUL 17, 1984 TO JUL 17, 1984
CANADIAN INDUSTRIES LTD.                        INDUSTRIAL CHEMICALS FORT SASKATCHEWAN
FINAL EFFLUENT COMPOSITE

                            08304L      08202L       06107L      06154L      06001L      06051L      06006L      06905L
                            OXYGEN      OXYGEN       CARBON      CARBON      CARBON      CARBON      CARBON      CARBON
                             TOTAL     BIOCHEM.    DISSOLVED   DISSOLVED      TOTAL       TOTAL      TOTAL     PARTICULATE
                               COD    DEMAND-BOD    ORGANIC    INORGANIC    ORGANIC    INORGANIC                 TOTAL
                    SUBM     02            O2           C           C           C           C           C           C
                     ID     MG/L         MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)               1(0)                     1(0)        1(0)                                             1(0)
           LOW               15.9                     3.80       26.70                                             1.76
          HIGH               15.9                     3.80       26.70                                             1.76
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE

                            24101L      24009L       24302L      80015L      80011L      27009L      27302L      47304L
                           CHROMIUM    CHROMIUM     CHROMIUM     MERCURY     MERCURY      COBALT      COBALT      SILVER
                          HEXAVALENT    TOTAL       EXTRBLE.      TOTAL       TOTAL       TOTAL      EXTRBLE.    EXTRBLE.

                    SUBM     CR           CR           CR          HG          HG          CO          CO          AG
                     ID     MG/L         MG/L         MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)                            1(0)                                             1(0)
           LOW                            .009                                             .005
          HIGH                            .009                                             .005
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE

                            29009L      29305L       28009L      28302L      48009L      48302L      82009L      82302L
                            COPPER      COPPER       NICKEL      NICKEL      CADMIUM     CADMIUM      LEAD        LEAD
                             TOTAL     EXTRBLE.      TOTAL      EXTRBLE.     TOTAL      EXTRBLE.     TOTAL      EXTRBLE.

                    SUBM     CU           CU           NI          NI          CD          CD          PB          PB
                     ID     MG/L         MG/L         MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)               1(0)                     1(0)                    1(0)                                 1(1)
           LOW               .032                     .011                    .002                                 L.003
          HIGH               .032                     .011                    .002                                 L.003
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
```

```
REQUEST 0010 -  0012 PAGE 128
                                                  NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                     INDUSTRIAL MONITORING
STATION 20AL05EB5701    LAT. 53D 43M 16S  LONG. 113D 10M 46S   PR 3   UTM 12 356200E 5954500N  FOR JUL 17, 1984 TO JUL 17, 1984
CANADIAN INDUSTRIES LTD.                       INDUSTRIAL CHEMICALS FORT SASKATCHEWAN
FINAL EFFLUENT COMPOSITE

                         30009L     30305L     25003L     25304L     23009L     42304L     42009L     51003L
                          ZINC       ZINC     MANGANESE  MANGANESE  VANADIUM  MOLYBDENUM MOLYBDENUM  ANTIMONY
                         TOTAL     EXTRBLE.    TOTAL     EXTRBLE.    TOTAL     EXTRBLE.    TOTAL      TOTAL

                 SUBM     ZN         ZN         MN         MN          V          MO         MO         SB
                  ID     MG/L       MG/L       MG/L       MG/L       MG/L        MG/L       MG/L       MG/L
SAMPLES(FLAGS)            1(0)                  1(0)                  1(0)                   1(0)
           LOW             .095                  .120                  .006                   .009
          HIGH             .095                  .120                  .006                   .009
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE

                         33005L     33104L     34005L     34102L     13111L     13306L     04102L     04304L
                         ARSENIC    ARSENIC   SELENIUM   SELENIUM   ALUMINUM   ALUMINUM  BERYLLIUM  BERYLLIUM
                         TOTAL     DISSOLVED   TOTAL     DISSOLVED  DISSOLVED  EXTRBLE.  DISSOLVED   EXTRBLE.

                 SUBM     AS         AS         SE         SE         AL         AL         BE         BE
                  ID     MG/L       MG/L       MG/L       MG/L       UG/L       MG/L       MG/L       MG/L
SAMPLES(FLAGS)           1(0)                                                   1(0)                  1(1)
           LOW           .0390                                                  1.590                 L.001
          HIGH           .0390                                                  1.590                 L.001
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE 129                     NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB5800    LAT. 53D 44M 10S  LONG. 113D 11M 35S   PR 3   UTM 12 355350E 5956150N  FOR APR 14, 1980 TO MAY 29, 1984
SHERRITT GORDON MINES LTD FT SASK        FINAL EFFLUENT - GRAB
RIVER LOT 7 FT SASK SETTLEMENT

                            02061F        10301L        10301F        10151L        10101L        02041L        97160S        97163S
                       TEMPERATURE            PH            PH    ALKALINITY    ALKALINITY      SPECIFIC     DISCHARGE     DISCHARGE
                          OF WATER                                    PHENOL         TOTAL      CONDUCT.       INSTANT         DAILY
                                                                   PHTHALEIN                                                    MEAN
              SUBM                                                     CACO3         CACO3
                ID           DEG.C      PH UNITS      PH UNITS          MG/L          MG/L         US/CM          M3/S           CFS
SAMPLES(FLAGS)               30(0)         35(0)          9(0)         32(1)         29(0)         35(0)                       35(0)
           LOW                12.0           1.5           6.8            .0           20.          645.                        .632
          HIGH                40.5          10.5           9.9          335.         5325.        19580.                        3.14
       AVERAGE                27.6                                     17.6*         409.1         2936.                      1.9279
      STD.DEV.                 7.8                                     60.0*         971.7         3971.                       .6752
   PERCNT:10TH                17.0           3.2                          .0           70.         1085.                       1.297
          25TH                22.0           7.4           7.9            .0          105.         1342.                        1.39
   MEDIAN 50TH                28.0           8.1           8.2            .0          169.         1763.                        1.63
          75TH                34.0          8.46           8.4           7.9          340.         2720.                        2.63
          90TH                37.0           8.7                        45.8          477.         4140.                        2.74
SECONDARY CODE

                            06201L        06202L        06301L        20103L        20105L        10602L        10604L        97160S
                        BICARBONT.    BICARBONT.     CARBONATE       CALCIUM       CALCIUM      HARDNESS      HARDNESS     DISCHARGE
                          (CALCD.)      (CALCD.)      (CALCD.)     DISSOLVED     DISSOLVED         TOTAL         TOTAL       INSTANT
                                                                                  (CALCD.)      (CALCD.)
              SUBM            HCO3          HCO3           CO3            CA            CA         CACO3         CACO3
                ID            MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          M3/S
SAMPLES(FLAGS)               29(1)          8(0)         29(1)         31(0)          5(0)         29(0)          3(0)
           LOW                 24.           55.            0.            5.          49.7          86.6          182.
          HIGH               6491.         6491.          402.          540.          75.0        2192.4          216.
       AVERAGE                451.*         917.           23.*         99.5          61.8         395.0         196.3
      STD.DEV.               1172.*        2253.           75.*        112.8          11.4         447.2          17.6
   PERCNT:10TH                 54.                          0.           34.                       134.3
          25TH                111.           98.            0.           46.          50.0         187.3
   MEDIAN 50TH                206.          124.            0.          68.0          66.6         264.5          191.
          75TH                369.          172.           10.          109.          67.7         352.5
          90TH                495.                         64.          145.                       633.8
SECONDARY CODE                                              11L 10L

                            11103L        12102L        19103L        09107L        17203L        16306L        26009L        26304L
                            SODIUM     MAGNESIUM     POTASSIUM      FLUORIDE      CHLORIDE      SULPHATE          IRON          IRON
                         DISSOLVED     DISSOLVED     DISSOLVED     DISSOLVED     DISSOLVED     DISSOLVED         TOTAL      EXTRBLE.

              SUBM              NA            MG             K             F            CL           SO4            FE            FE
                ID            MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)               32(0)         32(0)         32(0)         32(0)         32(0)         32(0)          3(0)         32(0)
           LOW                 14.            8.           1.4           .12            7.          146.           .53           .05
          HIGH                455.          205.          18.2          4.30          410.         6000.          1.01          9.34
       AVERAGE                75.5          31.7          4.41          .427         36.00         822.3          .787         1.235
      STD.DEV.                82.2          38.8          3.54          .722         69.55        1181.2          .242         1.801
   PERCNT:10TH                 23.           12.           1.9           .16           11.          255.                         .19
          25TH                31.0          16.0          2.10          .220         14.00         320.0                        .280
   MEDIAN 50TH                45.5          20.5          3.10          .285         19.00         490.0           .82          .655
          75TH                92.5          28.5          5.75          .345         36.00         695.0                       1.215
          90TH               130.0           55.           7.8           .36         47.00         1200.                        2.28
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE 130                     NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                     INDUSTRIAL MONITORING
STATION 20AL05EB5800    LAT. 53D 44M 10S  LONG. 113D 11M 35S   PR 3   UTM 12 355350E 5956150N  FOR APR 14, 1980 TO MAY 29, 1984
SHERRITT GORDON MINES LTD FT SASK         FINAL EFFLUENT - GRAB
RIVER LOT 7 FT SASK SETTLEMENT

                      07105L        07205L        07562L        07021L        07906L        07905L        15421L        97160S
                     NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN     PHOSPHORUS    DISCHARGE
                     DISSOLVED     DISSOLVED     DISSOLVED      TOTAL      PARTICULATE   PARTICULATE     TOTAL        INSTANT
                     NO3 & NO2     NITRITE       AMMONIA       KJELDAHL       TOTAL        (CALCD.)
               SUBM     N             N             N             N             N             N             P
                ID     MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          M3/S
SAMPLES(FLAGS)         35(0)         35(5)         35(0)         35(0)         31(0)                       35(0)
           LOW          4.60          L.05         11.600        22.750          .060                        .06
          HIGH        150.           11.4        1560.0        2640.0          2.25                       81.250
       AVERAGE         17.820         1.397*      156.463       216.561          .925                        4.417
      STD.DEV.         24.146         2.316*      254.484       430.802          .623                       14.609
  PERCNT:10TH           8.25          L.050        29.200        45.000          .220                         .125
          25TH         10.00           .200        59.67         77.500          .36                          .260
   MEDIAN 50TH         12.60           .61        108.00        142.00           .87                          .700
          75TH         14.00          1.65        175.00        197.50          1.34                         1.810
          90TH         26.50          3.0         240.          280.            1.82                         5.58
SECONDARY CODE                                    61L           15L                                        19L

                      10474L        10407L        10511L        10453L        14101L        97160S        97163S
                      RESIDUE       RESIDUE       RESIDUE       RESIDUE       SILICA       DISCHARGE     DISCHARGE
                       TOTAL     NONFILTRABLE    VOLATILE     FILTRABLE     REACTIVE       INSTANT        DAILY
                                                 NONFILTR.                                                 MEAN
               SUBM                              (CALCD.)                     SIO2
                ID     MG/L          MG/L          MG/L          MG/L          MG/L          M3/S          CFS
SAMPLES(FLAGS)         35(0)         35(0)                       31(0)         32(0)                       35(0)
           LOW          408.            9.                        330.           2.5                        .632
          HIGH        11683.          881.                      11360.          13.2                        3.14
       AVERAGE         1934.3         205.4                      1825.5          6.32                       1.9279
      STD.DEV.         2220.1         243.5                      2319.5          2.29                        .6752
  PERCNT:10TH           582.           23.0                       530.           3.8                        1.297
          25TH          828.           34.                        760.           5.00                       1.39
   MEDIAN 50TH         1369.           88.                       1070.           6.15                       1.63
          75TH         2065.          375.                       1690.           7.00                       2.63
          90TH         2853.          614.                       2690.           8.7                        2.74
SECONDARY CODE         71L           01L                                       02L

                      00205L        02074L        06537L        06524L        02001L        16101L        10701L        06608L
                       TOTAL       TURBIDITY      PHENOLIC      OIL AND        ODOUR       SULPHIDE      SURFACT.       CYANIDE
                     DISSOLVED                    MATERIAL     GREASE       THRESHOLD     DISSOLVED     N-ALKYL
                       SOLIDS                                                 NUMBER                     SULPHNTS.
               SUBM                               PHENOL                                      S            LAS           CN
                ID     MG/L           NTU          MG/L          MG/L           TON          MG/L          MG/L          MG/L
SAMPLES(FLAGS)         32(0)         26(0)         34(4)         35(0)         1(0)                        26(0)         5(0)
           LOW          351.           3.0          L.002          1.7           1.                          .07          .005
          HIGH         6941.         335.0           .026         22.6           1.                         5.85          .031
       AVERAGE         1392.7         98.1           .008*         7.309                                    1.666         .0134
      STD.DEV.         1402.3         97.7           .006*         4.881                                    1.698         .0108
  PERCNT:10TH           553.          15.0          L.002          2.9                                       .20
          25TH          709.5         24.0           .005          3.900                                     .28          .005
   MEDIAN 50TH          907.5         50.0           .007          5.                                        .800         .010
          75TH         1520.0        200.0           .010         10.                                       2.90          .016
          90TH         1938.         235.0           .020         14.4                                      4.25
SECONDARY CODE                       73L                         21L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE 131                       NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                      INDUSTRIAL MONITORING
STATION 20AL05EB5800    LAT. 53D 44M 10S  LONG. 113D 11M 35S   PR 3   UTM 12 355350E 5956150N  FOR APR 14, 1980 TO MAY 29, 1984
SHERRITT GORDON MINES LTD FT SASK          FINAL EFFLUENT - GRAB
RIVER LOT 7 FT SASK SETTLEMENT

                        08304L      08202L       06107L      06154L      06001L      06051L      06006L      06905L
                        OXYGEN      OXYGEN       CARBON      CARBON      CARBON      CARBON      CARBON      CARBON
                          TOTAL     BIOCHEM.    DISSOLVED   DISSOLVED     TOTAL       TOTAL     TOTAL       PARTICULATE
                           COD     DEMAND-BOD    ORGANIC    INORGANIC    ORGANIC    INORGANIC                  TOTAL
                 SUBM     O2            O2          C           C           C           C           C            C
                  ID    MG/L          MG/L        MG/L        MG/L        MG/L        MG/L        MG/L         MG/L
SAMPLES(FLAGS)           35(0)        2(0)        31(0)       31(0)        4(0)        1(0)        1(0)        30(0)
           LOW            22.1        14.7          4.8         1.2        44.9       75.         184.           .41
          HIGH           686.0        21.3       1700.0       151.        109.        75.         184.         49.07
       AVERAGE           171.6        18.00        95.79       41.56       67.47                               16.48
      STD.DEV.           147.9         4.67       300.56       34.46       28.36                               14.62
  PERCNT:10TH             40.2                      6.9        10.2                                             3.18
          25TH            61.5                     14.         17.0        51.35                                6.32
  MEDIAN 50TH            109.6        18.00        27.0        24.0        58.00                               10.93
          75TH           275.                      69.         71.         83.60                               23.54
          90TH           330.0                    109.         75.                                             45.47
SECONDARY CODE          01L                                               07L

                        24101L      24009L       24302L      80015L      80011L      27009L      27302L      47304L
                       CHROMIUM    CHROMIUM     CHROMIUM    MERCURY     MERCURY      COBALT      COBALT      SILVER
                      HEXAVALENT    TOTAL       EXTRBLE.     TOTAL       TOTAL       TOTAL      EXTRBLE.    EXTRBLE.

                 SUBM     CR          CR           CR          HG          HG          CO          CO          AG
                  ID    MG/L        MG/L         MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           31(6)       35(1)                    31(27)                  35(0)                    3(3)
           LOW           L.001        .381                   L.0001                    .072                    L.02
          HIGH           1.690       L5.8                      .0005                  3.260                    L.02
       AVERAGE            .541*      1.027*                    .0001*                  .573
      STD.DEV.            .429*       .885*                    .0001*                  .667
  PERCNT:10TH            L.001        .453                   L.0001                    .142
          25TH            .260        .673                   L.0001                    .202
  MEDIAN 50TH             .473        .904                   L.0001                    .370                    L.02
          75TH            .870       1.110                   L.0001                    .634
          90TH            .970       1.360                     .0002                  1.160
SECONDARY CODE

                        29009L      29305L       28009L      28302L      48009L      48302L      82009L      82302L
                        COPPER      COPPER       NICKEL      NICKEL     CADMIUM     CADMIUM       LEAD        LEAD
                         TOTAL      EXTRBLE.      TOTAL     EXTRBLE.      TOTAL     EXTRBLE.      TOTAL     EXTRBLE.

                 SUBM     CU          CU           NI          NI          CD          CD          PB          PB
                  ID    MG/L        MG/L         MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           35(0)                    35(0)                   35(6)                   19(3)       16(4)
           LOW            .009                      .238                  L.001                   L.003       L.003
          HIGH           1.490                    18.200                   .053                    .151        .04
       AVERAGE            .098                     2.877                   .006*                   .029*       .012*
      STD.DEV.            .245                     3.121                   .009*                   .035*       .010*
  PERCNT:10TH             .022                      .665                   .002                   L.003       L.003
          25TH            .027                     1.040                   .002                    .005        .004
  MEDIAN 50TH             .046                     2.390                   .005                    .021        .008*
          75TH            .080                     3.630                   .007                    .033        .017*
          90TH            .134                     4.890                  L.01                     .077        .022
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

REQUEST 0010 - 0012 PAGE 132 NAQUADAT SUMMARY REPORT JAN 08, 1986

INDUSTRIAL MONITORING

STATION 20AL05EB5800 LAT. 53D 44M 10S LONG. 113D 11M 35S PR 3 UTM 12 355350E 5956150N FOR APR 14, 1980 TO MAY 29, 1984
SHERRITT GORDON MINES LTD FT SASK FINAL EFFLUENT - GRAB
RIVER LOT 7 FT SASK SETTLEMENT

	30009L ZINC TOTAL	30305L ZINC EXTRBLE.	25003L MANGANESE TOTAL	25304L MANGANESE EXTRBLE.	23009L VANADIUM TOTAL	42304L MOLYBDENUM EXTRBLE.	42009L MOLYBDENUM TOTAL	51003L ANTIMONY TOTAL
SUBM ID	ZN MG/L	ZN MG/L	MN MG/L	MN MG/L	V MG/L	MO MG/L	MO MG/L	SB MG/L
SAMPLES(FLAGS)	35(0)		35(0)		28(3)		30(7)	
LOW	.586		.013		L.002		L.001	
HIGH	7.020		1.210		.073		.239	
AVERAGE	2.687		.111		.012*		.018*	
STD.DEV.	1.563		.220		.015*		.043*	
PERCNT:10TH	.815		.022		.003		L.001	
25TH	1.520		.027		.005		.005	
MEDIAN 50TH	2.500		.055		.006		.008	
75TH	3.140		.094		.011		.011	
90TH	5.160		.173		.022		.027*	
SECONDARY CODE								

	33005L ARSENIC TOTAL	33104L ARSENIC DISSOLVED	34005L SELENIUM TOTAL	34102L SELENIUM DISSOLVED	13111L ALUMINUM DISSOLVED	13306L ALUMINUM EXTRBLE.	04102L BERYLLIUM DISSOLVED	04304L BERYLLIUM EXTRBLE.
SUBM ID	AS MG/L	AS MG/L	SE MG/L	SE MG/L	AL UG/L	AL MG/L	BE MG/L	BE MG/L
SAMPLES(FLAGS)	16(0)		16(12)			27(0)		26(26)
LOW	.0048		L.0002			.123		L.001
HIGH	.0480		.0142			30.700		L.001
AVERAGE	.0160		.0011*			2.687		
STD.DEV.	.0130		.0035*			5.774		
PERCNT:10TH	.0051		L.0002			.500		L.001
25TH	.0065		L.0002			.660		L.001
MEDIAN 50TH	.0108		L.0002			1.120		L.001
75TH	.0223		.0003*			2.250		L.001
90TH	.0365		.0010			4.320		L.001
SECONDARY CODE								

* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q

```
REQUEST 0001 -  0003 PAGE 133                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB5801    LAT. 53D 44M 10S  LONG. 113D 11M 35S   PR 3   UTM 12 355350E 5956150N  FOR AUG 19, 1980 TO MAY 29, 1984
SHERRITT GORDON MINES LTD  FT SASK         FINAL EFFLUENT COMP
RIVER LOT 7 FT SASK SETTLEMENT

                       02061F       10301L      10301F      10151L      10101L      02041L      97160S      97163S
                     TEMPERATURE      PH          PH      ALKALINITY  ALKALINITY   SPECIFIC   DISCHARGE   DISCHARGE
                      OF WATER                              PHENOL      TOTAL      CONDUCT.    INSTANT      DAILY
                                                          PHTHALEIN                                         MEAN
                 SUBM                                       CACO3       CACO3
                  ID    DEG.C       PH UNITS    PH UNITS    MG/L        MG/L        US/CM       M3/S        CFS
SAMPLES(FLAGS)                        8(0)        1(0)        5(0)        6(0)        8(0)                    8(0)
           LOW                        6.10        8.9          .0        10.8       1039.                    1.38
          HIGH                        8.5         8.9        10.0       301.        2740.                    2.9
       AVERAGE                                                2.0       187.3       1967.                    2.0012
      STD.DEV.                                                4.5       111.7        526.                     .6511
   PERCNT:10TH
          25TH                        8.03                     .0       117.        1699.                    1.4850
   MEDIAN 50TH                        8.20                     .0       202.5       1945.                    1.6700
          75TH                        8.27                     .0       290.        2335.                    2.7100
          90TH
SECONDARY CODE

                       06201L      06202L      06301L      20103L      20105L      10602L      10604L      97160S
                     BICARBONT.  BICARBONT.  CARBONATE    CALCIUM     CALCIUM    HARDNESS    HARDNESS   DISCHARGE
                      (CALCD.)    (CALCD.)    (CALCD.)   DISSOLVED   DISSOLVED    TOTAL       TOTAL      INSTANT
                                                                      (CALCD.)   (CALCD.)
                 SUBM   HCO3        HCO3        CO3         CA          CA        CACO3       CACO3
                  ID   MG/L         MG/L        MG/L        MG/L        MG/L       MG/L        MG/L        M3/S
SAMPLES(FLAGS)          5(0)        3(0)        5(0)        6(0)        1(0)       5(0)        1(0)
           LOW          143.         13.          0.         47.       316.7      179.1        932.
          HIGH          354.        204.         12.        317.       316.7      464.5        932.
       AVERAGE          266.        120.          2.        119.2                 305.8
      STD.DEV.           91.         97.          5.        101.2                 118.9
   PERCNT:10TH
          25TH          205.                      0.         51.                  201.5
   MEDIAN 50TH          289.        143.          0.         87.5                 311.7
          75TH          343.                      0.        125.                  372.3
          90TH
SECONDARY CODE                                           11L 10L

                       11103L      12102L      19103L      09107L      17203L      16306L      26009L      26304L
                       SODIUM     MAGNESIUM   POTASSIUM   FLUORIDE    CHLORIDE    SULPHATE     IRON        IRON
                     DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED    TOTAL      EXTRBLE.

                 SUBM   NA          MG          K           F           CL          SO4         FE          FE
                  ID   MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)          6(0)        6(0)        6(0)        6(0)        6(0)        6(0)        2(0)        6(0)
           LOW          73.         15.         1.9          .19        41.        210.         1.10         .16
          HIGH         217.0        37.         5.40         .58       200.00      820.0        1.12        3.50
       AVERAGE         126.3        27.3        3.23         .340      104.00      555.0        1.110       1.073
      STD.DEV.          51.9         8.9        1.29         .136       61.83      226.9         .014       1.258
   PERCNT:10TH
          25TH          86.         18.         2.4          .24        51.        410.                      .21
   MEDIAN 50TH         119.0        30.0        2.90         .325       88.50      560.0        1.110        .725
          75TH         144.         34.         3.9          .38       155.        770.                     1.12
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE 134                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                  INDUSTRIAL MONITORING
STATION 20AL05EB5801     LAT. 53D 44M 10S  LONG. 113D 11M 35S   PR 3   UTM 12 355350E 5956150N  FOR AUG 19, 1980 TO MAY 29, 1984
SHERRITT GORDON MINES LTD  FT SASK         FINAL EFFLUENT COMP
RIVER LOT 7 FT SASK SETTLEMENT

                              07105L      07205L      07562L      07021L      07906L      07905L      15421L      97160S
                             NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN   PHOSPHORUS  DISCHARGE
                             DISSOLVED   DISSOLVED   DISSOLVED    TOTAL    PARTICULATE PARTICULATE   TOTAL      INSTANT
                             NO3 & NO2   NITRITE     AMMONIA     KJELDAHL     TOTAL     (CALCD.)
                      SUBM      N           N           N           N           N           N           P
                       ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        M3/S
SAMPLES(FLAGS)                8(0)        8(0)        8(0)        8(0)        6(0)                    8(0)
           LOW               2.5          .190      28.200      64.000        .51                    .030
          HIGH              18.          4.50      152.00      235.          1.77                    .938
       AVERAGE              11.088       1.713     104.037     145.438       1.068                   .412
      STD.DEV.               4.281       1.755      50.161      57.182        .505                   .313
  PERCNT:10TH
          25TH              10.200        .450      60.650      94.500        .600                   .160
   MEDIAN 50TH              11.400        .700     115.000     154.875       1.055                   .395
          75TH              12.500       3.355     150.400     182.875       1.42                    .610
          90TH
SECONDARY CODE                                     61L         15L                                 19L

                              10474L      10407L      10511L      10453L      14101L      97160S      97163S
                             RESIDUE     RESIDUE     RESIDUE     RESIDUE      SILICA    DISCHARGE   DISCHARGE
                              TOTAL   NONFILTRABLE  VOLATILE   FILTRABLE   REACTIVE     INSTANT      DAILY
                                                   NONFILTR.                                         MEAN
                      SUBM                         (CALCD.)                  SIO2
                       ID    MG/L        MG/L        MG/L        MG/L        MG/L        M3/S         CFS
SAMPLES(FLAGS)                8(0)        8(0)                    6(0)        6(0)                    8(0)
           LOW               643.         42.0                   600.         3.1                    1.38
          HIGH              2392.        862.                   1830.0        9.0                    2.9
       AVERAGE              1467.0       377.3                  1111.7        6.10                   2.0012
      STD.DEV.               578.2       306.9                   498.8        2.69                    .6511
  PERCNT:10TH
          25TH               989.5        82.0                   650.         3.1                    1.4850
   MEDIAN 50TH              1477.0       347.0                  1030.0        6.30                   1.6700
          75TH              1884.1       628.0                  1530.         8.8                    2.7100
          90TH
SECONDARY CODE                          01L                                  02L

                              00205L      02074L      06537L      06524L      02001L      16101L      10701L      06608L
                              TOTAL     TURBIDITY    PHENOLIC    OIL AND      ODOUR     SULPHIDE    SURFACT.     CYANIDE
                            DISSOLVED                MATERIAL    GREASE     THRESHOLD   DISSOLVED   N-ALKYL
                             SOLIDS                                          NUMBER                 SULPHNTS.
                      SUBM                           PHENOL                                 S          LAS          CN
                       ID    MG/L         NTU        MG/L        MG/L         TON         MG/L        MG/L        MG/L
SAMPLES(FLAGS)                6(0)        5(0)        7(0)        7(0)                                4(0)
           LOW               553.         20.0        .004        4.6                                 .13
          HIGH              1456.        400.0        .035       20.3                                2.45
       AVERAGE              1112.1       215.0        .012       11.643                              1.017
      STD.DEV.               332.5       171.6        .011        5.604                              1.086
  PERCNT:10TH
          25TH               988.         45.0        .004        8.0                                 .175
   MEDIAN 50TH              1122.0       290.0        .010       10.0                                 .745
          75TH              1431.7       320.0        .012       17.9                                1.860
          90TH
SECONDARY CODE                                                   21L
```

NAQUADAT SUMMARY REPORT JAN 08, 1986
INDUSTRIAL MONITORING

STATION 20AL05EB5801 LAT. 53D 44M 10S LONG. 113D 11M 35S PR 3 UTM 12 355350E 5956150N FOR AUG 19, 1980 TO MAY 29, 1984
SHERRITT GORDON MINES LTD FT SASK FINAL EFFLUENT COMP
RIVER LOT 7 FT SASK SETTLEMENT

	08304L OXYGEN TOTAL COD	08202L OXYGEN BIOCHEM. DEMAND-BOD	06107L CARBON DISSOLVED ORGANIC	06154L CARBON DISSOLVED INORGANIC	06001L CARBON TOTAL ORGANIC	06051L CARBON TOTAL INORGANIC	06006L CARBON TOTAL	06905L CARBON PARTICULATE TOTAL
SUBM	02	02	C	C	C	C	C	C
ID	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
SAMPLES(FLAGS)	8(0)		6(0)	6(0)	2(0)			6(0)
LOW	66.0		16.	5.30	55.2			9.67
HIGH	273.0		70.0	66.	79.6			101.54
AVERAGE	137.4		31.97	35.22	67.40			46.59
STD.DEV.	67.7		21.42	22.70	17.25			35.84
PERCNT:10TH								
25TH	86.9		18.	14.0				10.62
MEDIAN 50TH	127.0		21.40	38.00	67.40			42.71
75TH	166.0		45.	50.				72.26
90TH								
SECONDARY CODE	01L				07L			

	24101L CHROMIUM HEXAVALENT	24009L CHROMIUM TOTAL	24302L CHROMIUM EXTRBLE.	80015L MERCURY TOTAL	80011L MERCURY TOTAL	27009L COBALT TOTAL	27302L COBALT EXTRBLE.	47304L SILVER EXTRBLE.
SUBM	CR	CR	CR	HG	HG	CO	CO	AG
ID	MG/L	MG/L	MG/L	MG/L	UG/L	MG/L	MG/L	MG/L
SAMPLES(FLAGS)	6(1)	8(0)		6(5)		8(0)		2(2)
LOW	L.001	.481		L.0001		.122		L.02
HIGH	.745	1.070		.0002		.65		L.02
AVERAGE	.471*	.768		.0001*		.382		
STD.DEV.	.277*	.197		.0000*		.158		
PERCNT:10TH								
25TH	.380	.622		L.0001		.294		
MEDIAN 50TH	.491	.814		L.0001		.389		L.020
75TH	.720	.861		L.0001		.458		
90TH								
SECONDARY CODE								

	29009L COPPER TOTAL	29305L COPPER EXTRBLE.	28009L NICKEL TOTAL	28302L NICKEL EXTRBLE.	48009L CADMIUM TOTAL	48302L CADMIUM EXTRBLE.	82009L LEAD TOTAL	82302L LEAD EXTRBLE.
SUBM	CU	CU	NI	NI	CD	CD	PB	PB
ID	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
SAMPLES(FLAGS)	8(0)		8(0)		8(1)		3(0)	5(0)
LOW	.106		.512		.002		.033	.012
HIGH	1.600		3.900		.01		.065	.154
AVERAGE	.640		2.358		.006*		.045	.056
STD.DEV.	.518		1.243		.003*		.017	.058
PERCNT:10TH								
25TH	.216		1.246		.004			.015
MEDIAN 50TH	.520		2.735		.005		.038	.04
75TH	.971		3.245		.008*			.06
90TH								
SECONDARY CODE								

NAQUADAT SUMMARY REPORT JAN 08, 1986
INDUSTRIAL MONITORING

STATION 20AL05EB5801 LAT. 53D 44M 10S LONG. 113D 11M 35S PR 3 UTM 12 355350E 5956150N FOR AUG 19, 1980 TO MAY 29, 1984
SHERRITT GORDON MINES LTD FT SASK FINAL EFFLUENT COMP
RIVER LOT 7 FT SASK SETTLEMENT

	30009L ZINC TOTAL	30305L ZINC EXTRBLE.	25003L MANGANESE TOTAL	25304L MANGANESE EXTRBLE.	23009L VANADIUM TOTAL	42304L MOLYBDENUM EXTRBLE.	42009L MOLYBDENUM TOTAL	51003L ANTIMONY TOTAL
SUBM ID	ZN MG/L	ZN MG/L	MN MG/L	MN MG/L	V MG/L	MO MG/L	MO MG/L	SB MG/L
SAMPLES(FLAGS)	8(0)		8(0)		5(1)		7(1)	
LOW	1.030		.019		L.002		.004	
HIGH	9.60		.146		.010		.02	
AVERAGE	4.687		.070		.006*		.012*	
STD.DEV.	3.105		.037		.004*		.006*	
PERCNT:10TH								
25TH	2.085		.050		.003		.009	
MEDIAN 50TH	4.490		.068		.006		.010	
75TH	6.860		.079		.009		L.02	
90TH								
SECONDARY CODE								

	33005L ARSENIC TOTAL	33104L ARSENIC DISSOLVED	34005L SELENIUM TOTAL	34102L SELENIUM DISSOLVED	13111L ALUMINUM DISSOLVED	13306L ALUMINUM EXTRBLE.	04102L BERYLLIUM DISSOLVED	04304L BERYLLIUM EXTRBLE.
SUBM ID	AS MG/L	AS MG/L	SE MG/L	SE MG/L	AL UG/L	AL MG/L	BE MG/L	BE MG/L
SAMPLES(FLAGS)	3(0)		3(2)			5(0)		5(5)
LOW	.0075		L.0002			.250		L.001
HIGH	.0258		.0004			2.580		L.001
AVERAGE	.0178		.0003*			1.456		
STD.DEV.	.0094		.0001*			.946		
PERCNT:10TH								
25TH						1.070		L.001
MEDIAN 50TH	.0200		L.0002			1.140		L.001
75TH						2.240		L.001
90TH								
SECONDARY CODE								

* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q

```
REQUEST 0001 -  0003 PAGE 137                         NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                         INDUSTRIAL MONITORING
STATION 20AL05EB5803    LAT. 53D 44M 10S  LONG. 113D 11M 35S   PR 3   UTM 12 355350E 5956150N  FOR NOV 18, 1981 TO NOV 18, 1981
SHERRITT GORDON MINES LTD FT SASK          STORM WATER POND INLET GRAB
RIVER LOT 7 FT SASK SETTLEMENT

                           02061F         10301L         10301F         10151L         10101L         02041L         97160S         97163S
                         TEMPERATURE        PH             PH         ALKALINITY     ALKALINITY      SPECIFIC      DISCHARGE      DISCHARGE
                         OF WATER                                       PHENOL         TOTAL         CONDUCT.       INSTANT         DAILY
                                                                      PHTHALEIN                                                     MEAN
                   SUBM                                                 CACO3          CACO3
                    ID     DEG.C          PH UNITS       PH UNITS       MG/L           MG/L           US/CM          M3/S            CFS
SAMPLES(FLAGS)              1(0)           1(0)           1(0)          1(0)           1(0)           1(0)
           LOW              17.0            8.5            8.6            7.5          112.           1402.
          HIGH              17.0            8.5            8.6            7.5          112.           1402.
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE

                          06201L         06202L         06301L         20103L         20105L         10602L         10604L         97160S
                        BICARBONT.     BICARBONT.     CARBONATE      CALCIUM        CALCIUM        HARDNESS       HARDNESS       DISCHARGE
                         (CALCD.)       (CALCD.)       (CALCD.)      DISSOLVED      DISSOLVED       TOTAL          TOTAL          INSTANT
                                                                                    (CALCD.)       (CALCD.)
                   SUBM    HCO3           HCO3           CO3            CA             CA           CACO3          CACO3
                    ID   MG/L           MG/L           MG/L           MG/L           MG/L           MG/L           MG/L            M3/S
SAMPLES(FLAGS)              1(0)                          1(0)          1(0)           1(0)                          1(0)
           LOW              118.                            9.          60.            59.7                          244.
          HIGH              118.                            9.          60.            59.7                          244.
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE                                                          11L

                           11103L         12102L         19103L         09107L         17203L         16306L         26009L         26304L
                           SODIUM        MAGNESIUM      POTASSIUM      FLUORIDE       CHLORIDE       SULPHATE        IRON           IRON
                         DISSOLVED      DISSOLVED      DISSOLVED      DISSOLVED      DISSOLVED      DISSOLVED       TOTAL         EXTRBLE.

                   SUBM      NA             MG             K              F              CL            SO4            FE             FE
                    ID     MG/L           MG/L           MG/L           MG/L           MG/L           MG/L           MG/L           MG/L
SAMPLES(FLAGS)              1(0)           1(0)           1(0)          1(0)           1(0)           1(0)                          1(0)
           LOW              45.            23.            3.1            .78           10.            435.                          1.87
          HIGH              45.            23.            3.1            .78           10.            435.                          1.87
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE 138                     NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB5803    LAT. 53D 44M 10S  LONG. 113D 11M 35S   PR 3   UTM 12 355350E 5956150N  FOR NOV 18, 1981 TO NOV 18, 1981
SHERRITT GORDON MINES LTD FT SASK          STORM WATER POND INLET GRAB
RIVER LOT 7 FT SASK SETTLEMENT

                         07105L        07205L        07562L        07021L        07906L        07905L        15421L        97160S
                        NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN    PHOSPHORUS    DISCHARGE
                       DISSOLVED     DISSOLVED     DISSOLVED       TOTAL      PARTICULATE   PARTICULATE     TOTAL         INSTANT
                       NO3 & NO2      NITRITE       AMMONIA       KJELDAHL       TOTAL        (CALCD.)
                SUBM       N             N             N             N             N             N             P
                 ID      MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          M3/S
SAMPLES(FLAGS)           1(0)          1(0)          1(0)          1(0)          1(0)                        1(0)
           LOW          18.50           .45        41.250        45.000            .3                       1.250
          HIGH          18.50           .45        41.250        45.000            .3                       1.250
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE                                      61L           15L                                       19L

                         10474L        10407L        10511L        10453L        14101L        97160S        97163S
                        RESIDUE       RESIDUE       RESIDUE       RESIDUE        SILICA      DISCHARGE     DISCHARGE
                         TOTAL      NONFILTRABLE   VOLATILE     FILTRABLE      REACTIVE       INSTANT        DAILY
                                                   NONFILTR.                                                  MEAN
                SUBM                               (CALCD.)                      SIO2
                 ID      MG/L          MG/L          MG/L          MG/L          MG/L          M3/S           CFS
SAMPLES(FLAGS)           1(0)          1(0)                        1(0)          1(0)
           LOW           868.           28.                        840.           6.2
          HIGH           868.           28.                        840.           6.2
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE                                                                   02L

                         00205L        02074L        06537L        06524L        02001L        16101L        10701L        06608L
                         TOTAL       TURBIDITY      PHENOLIC      OIL AND        ODOUR        SULPHIDE      SURFACT.       CYANIDE
                       DISSOLVED                    MATERIAL      GREASE       THRESHOLD     DISSOLVED     N-ALKYL
                         SOLIDS                                                  NUMBER                    SULPHNTS.
                SUBM                                 PHENOL                                      S            LAS            CN
                 ID      MG/L          NTU           MG/L          MG/L           TON          MG/L          MG/L          MG/L
3AMPLES(FLAGS)           1(0)          1(0)          1(0)          1(0)                                      1(0)
           LOW           725.          23.0          .003          47.3                                      6.00
          HIGH           725.          23.0          .003          47.3                                      6.00
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
```

```
REQUEST 0007 -  0009 PAGE 139                   NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                 INDUSTRIAL MONITORING
STATION 20AL05EB5803    LAT. 53D 44M 10S  LONG. 113D 11M 35S   PR 3   UTM 12 355350E 5956150N  FOR NOV 18, 1981 TO NOV 18, 1981
SHERRITT GORDON MINES LTD FT SASK        STORM WATER POND INLET GRAB
RIVER LOT 7 FT SASK SETTLEMENT
                      08304L       08202L       06107L        06154L       06001L        06051L       06006L        06905L
                      OXYGEN        OXYGEN       CARBON        CARBON       CARBON        CARBON       CARBON        CARBON
                        TOTAL      BIOCHEM.     DISSOLVED    DISSOLVED       TOTAL         TOTAL     TOTAL         PARTICULATE
                         COD      DEMAND-BOD     ORGANIC      INORGANIC      ORGANIC      INORGANIC                 TOTAL
              SUBM      02              02         C             C             C             C           C            C
               ID     MG/L          MG/L          MG/L         MG/L          MG/L          MG/L         MG/L         MG/L
SAMPLES(FLAGS)          1(0)                       1(0)          1(0)                                                  1(0)
           LOW           20.6                       8.           21.                                                   24.
          HIGH           20.6                       8.           21.                                                   24.
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
                      24101L       24009L       24302L        80015L       80011L        27009L       27302L       47304L
                     CHROMIUM      CHROMIUM    CHROMIUM        MERCURY     MERCURY        COBALT       COBALT      SILVER
                    HEXAVALENT      TOTAL        EXTRBLE.      TOTAL        TOTAL         TOTAL        EXTRBLE.    EXTRBLE.

              SUBM     CR           CR            CR            HG           HG             CO           CO            AG
               ID     MG/L          MG/L          MG/L         MG/L          UG/L          MG/L         MG/L         MG/L
SAMPLES(FLAGS)         1(0)         1(0)                         1(1)                      1(0)
           LOW           .270          .450                     L.0001                       .295
          HIGH           .270          .450                     L.0001                       .295
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
                      29009L       29305L       28009L        28302L       48009L        48302L       82009L        82302L
                      COPPER       COPPER        NICKEL        NICKEL      CADMIUM        CADMIUM       LEAD          LEAD
                       TOTAL       EXTRBLE.      TOTAL         EXTRBLE.     TOTAL         EXTRBLE.     TOTAL       EXTRBLE.

              SUBM     CU             CU           NI            NI           CD            CD           PB            PB
               ID     MG/L          MG/L          MG/L         MG/L          MG/L          MG/L         MG/L         MG/L
SAMPLES(FLAGS)         1(0)                        1(0)                       1(0)                       1(0)
           LOW           .031                     4.080                        .005                       .005
          HIGH           .031                     4.080                        .005                       .005
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
```

```
REQUEST 0010 -  0012 PAGE 140                   NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                  INDUSTRIAL MONITORING
STATION 20AL05EB5803    LAT. 53D 44M 10S  LONG. 113D 11M 35S   PR 3   UTM 12 355350E 5956150N  FOR NOV 18, 1981 TO NOV 18, 1981
SHERRITT GORDON MINES LTD FT SASK        STORM WATER POND INLET GRAB
RIVER LOT 7 FT SASK SETTLEMENT
                           30009L       30305L       25003L       25304L       23009L       42304L       42009L       51003L
                            ZINC         ZINC       MANGANESE    MANGANESE    VANADIUM    MOLYBDENUM   MOLYBDENUM   ANTIMONY
                           TOTAL       EXTRBLE.      TOTAL       EXTRBLE.      TOTAL       EXTRBLE.      TOTAL        TOTAL

                  SUBM       ZN           ZN           MN           MN           V            MO           MO           SB
                   ID      MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)              1(0)                      1(0)                      1(0)
           LOW              1.470                      .068                      .006
          HIGH              1.470                      .068                      .006
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE 141                          NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                         INDUSTRIAL MONITORING
STATION 20AL05EB5804    LAT. 53D 44M 10S  LONG. 113D 11M 35S   PR 3   UTM 12 355350E 5956150N  FOR NOV 18, 1981 TO MAY 29, 1984
SHERRITT GORDON MINES LTD FT SASK          STORM WATER POND EFFLUENT GRAB
RIVER LOT 7 FT SASK SETTLEMENT

                           02061F       10301L       10301F       10151L       10101L       02041L       97160S       97163S
                         TEMPERATURE      PH           PH       ALKALINITY   ALKALINITY    SPECIFIC    DISCHARGE    DISCHARGE
                         OF WATER                                 PHENOL       TOTAL       CONDUCT.     INSTANT      DAILY
                                                                PHTHALEIN                                             MEAN
                    SUBM                                          CACO3        CACO3
                     ID    DEG.C       PH UNITS     PH UNITS      MG/L         MG/L         US/CM        M3/S         CFS
SAMPLES(FLAGS)             29(0)       30(0)        7(0)          29(0)        27(0)        30(0)                     33(0)
           LOW               3.0         3.3          5.3            .0           8.         1796.                      .12
          HIGH              32.0         9.60         8.4         1130.        4145.0       22400.                     2.74
       AVERAGE              12.1                                    55.5        553.0        5399.                      .6725
      STD.DEV.               6.4                                   211.8        965.0        3729.                      .5469
   PERCNT:10TH               4.0         4.80                         .0          28.         2865.                      .19
          25TH               8.0         6.6          6.7             .0         106.         3180.                      .30
   MEDIAN 50TH              11.0         7.60         6.8             .0         214.         4665.                      .56
          75TH              15.0         8.30         7.8             .0         461.         5760.                      .79
          90TH              20.0         8.85                        172.5       1288.         8170.                     1.308
SECONDARY CODE

                           06201L       06202L       06301L       20103L       20105L       10602L       10604L       97160S
                         BICARBONT.   BICARBONT.   CARBONATE     CALCIUM      CALCIUM     HARDNESS     HARDNESS     DISCHARGE
                          (CALCD.)     (CALCD.)     (CALCD.)    DISSOLVED    DISSOLVED      TOTAL        TOTAL       INSTANT
                                                                             (CALCD.)     (CALCD.)
                    SUBM   HCO3         HCO3          CO3           CA           CA         CACO3        CACO3
                     ID   MG/L          MG/L          MG/L         MG/L         MG/L         MG/L         MG/L         M3/S
SAMPLES(FLAGS)             26(0)        7(0)         26(0)        30(0)        2(0)         29(1)        1(0)
           LOW               10.         197.           0.           8.         87.7         28.2        347.
          HIGH             1419.        1259.        1356.         166.        124.5        650.7        347.
       AVERAGE              355.         599.          74.        104.3        106.1        419.3*
      STD.DEV.              348.         345.         268.         45.8         26.0        169.0*
   PERCNT:10TH               34.                        0.         21.5                     158.8
          25TH              129.         390.           0.          86.                     284.7
   MEDIAN 50TH              254.         522.           0.        119.0        106.1        474.3
          75TH              452.         814.           0.         131.                     538.6
          90TH              814.                      207.        156.0                     591.5
SECONDARY CODE                                               11L 10L

                           11103L       12102L       19103L       09107L       17203L       16306L       26009L       26304L
                           SODIUM      MAGNESIUM    POTASSIUM    FLUORIDE     CHLORIDE     SULPHATE       IRON         IRON
                         DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED      TOTAL       EXTRBLE.

                    SUBM    NA           MG            K            F            CL          SO4          FE           FE
                     ID    MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)             30(0)        30(1)        30(0)        30(0)        30(0)        30(0)                     30(2)
           LOW               91.          L0.          2.4         1.17          12.          650.                      L.02
          HIGH              530.          61.         35.0       580.00         180.         7900.                      2.69
       AVERAGE             212.8         38.0*       10.51       42.432        55.80        1844.7                      .464*
      STD.DEV.             100.8         15.4*        6.38      107.315        47.38        1302.1                      .586*
   PERCNT:10TH             117.0         10.5         4.60        3.400        17.50         910.0                      .100
          25TH              159.          31.          6.6         5.50          21.         1125.                      .17
   MEDIAN 50TH             183.0         42.0         8.40       15.550        32.50        1612.5                      .270
          75TH              239.          45.         13.0       32.500          82.         2000.                      .51
          90TH             375.0         54.0        17.80       50.500       134.00        2862.5                     1.025
SECONDARY CODE
```

```
REQUEST 0004 -  0006 PAGE 142                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB5804    LAT. 53D 44M 10S  LONG. 113D 11M 35S   PR 3   UTM 12 355350E 5956150N  FOR NOV 18, 1981 TO MAY 29, 1984
SHERRITT GORDON MINES LTD FT SASK         STORM WATER POND EFFLUENT GRAB
RIVER LOT 7 FT SASK SETTLEMENT

                               07105L        07205L        07562L        07021L        07906L        07905L        15421L        97160S
                              NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN     PHOSPHORUS    DISCHARGE
                              DISSOLVED     DISSOLVED     DISSOLVED      TOTAL      PARTICULATE   PARTICULATE     TOTAL        INSTANT
                              NO3 & NO2     NITRITE       AMMONIA       KJELDAHL       TOTAL        (CALCD.)
                      SUBM       N             N             N             N             N             N             P
                       ID      MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          M3/S
SAMPLES(FLAGS)                30(0)         29(1)         30(0)         30(0)         30(0)                       30(0)
           LOW                 4.00         L.05          58.000        69.500          .05                          .550
          HIGH                91.500         7.65         2702.0        3375.0         3.79                        1075.0
       AVERAGE                37.365         1.296*       536.333       836.067         .690                        68.185
      STD.DEV.                20.638         1.387*       589.441       968.227         .901                       192.188
  PERCNT:10TH                 14.750          .25         134.500       145.250         .100                         4.065
          25TH                23.5            .65         194.00        222.00          .15                          7.100
   MEDIAN 50TH                32.000          .920        366.000       427.500         .325                        31.500
          75TH                50.00          1.64         560.00        870.00          .860                        57.500
          90TH                63.500         2.35         1441.50       2577.50        1.755                        83.125
SECONDARY CODE                                            61L           15L                                        19L

                               10474L        10407L        10511L        10453L        14101L        97160S        97163S
                              RESIDUE       RESIDUE       RESIDUE       RESIDUE       SILICA      DISCHARGE     DISCHARGE
                               TOTAL     NONFILTRABLE   VOLATILE     FILTRABLE     REACTIVE      INSTANT        DAILY
                                                        NONFILTR.                                                MEAN
                      SUBM                              (CALCD.)                    SIO2
                       ID      MG/L          MG/L         MG/L          MG/L          MG/L          M3/S          CFS
SAMPLES(FLAGS)                30(0)         30(0)                       30(0)         30(0)                       33(0)
           LOW                 850.           5.                         820.          4.8                          .12
          HIGH                16991.         531.                       16460.         52.0                        2.74
       AVERAGE                3976.4         60.2                       3914.7         20.22                        .6725
      STD.DEV.                3055.9         97.6                       2975.4         10.12                        .5469
  PERCNT:10TH                 1743.0          7.5                       1715.0          9.25                        .19
          25TH                2258.          28.                        2230.          13.5                         .30
   MEDIAN 50TH                3189.5         34.5                       3155.0         17.65                        .56
          75TH                4147.          49.0                       4140.          28.4                         .79
          90TH                7474.5        117.0                       7415.0         33.25                       1.308
SECONDARY CODE                                                                         02L

                               00205L        02074L        06537L        06524L        02001L        16101L        10701L        06608L
                               TOTAL       TURBIDITY      PHENOLIC      OIL AND        ODOUR       SULPHIDE      SURFACT.      CYANIDE
                             DISSOLVED                    MATERIAL      GREASE       THRESHOLD     DISSOLVED      N-ALKYL
                              SOLIDS                                                   NUMBER                    SULPHNTS.
                      SUBM                                PHENOL                                       S            LAS           CN
                       ID      MG/L          NTU          MG/L          MG/L           TON          MG/L          MG/L          MG/L
SAMPLES(FLAGS)                30(0)         24(0)         29(0)         29(1)                                     24(0)         2(0)
           LOW                1031.           1.5          .004         L.2                                         .09         .014
          HIGH                11641.        100.0          .021         42.9                                      16.50         .061
       AVERAGE                3026.0         22.9          .011          3.185*                                    5.293        .0375
      STD.DEV.                1993.3         27.3          .005          7.932*                                    4.628        .0332
  PERCNT:10TH                 1467.5          3.0          .004           .4                                        .47
          25TH                1868.           5.1          .006           .9                                        .880
   MEDIAN 50TH                2560.0         12.5          .010          1.1                                       5.175        .0375
          75TH                3157.          24.0          .014          1.9                                       8.050
          90TH                5121.9         64.0          .019          4.170                                     10.60
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE 143                     NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB5804    LAT. 53D 44M 10S  LONG. 113D 11M 35S   PR 3   UTM 12 355350E 5956150N  FOR NOV 18, 1981 TO MAY 29, 1984
SHERRITT GORDON MINES LTD FT SASK         STORM WATER POND EFFLUENT GRAB
RIVER LOT 7 FT SASK SETTLEMENT

                          08304L      08202L      06107L      06154L      06001L      06051L      06006L      06905L
                          OXYGEN      OXYGEN      CARBON      CARBON      CARBON      CARBON      CARBON      CARBON
                           TOTAL      BIOCHEM.    DISSOLVED   DISSOLVED   TOTAL       TOTAL       TOTAL       PARTICULATE
                           COD        DEMAND-BOD  ORGANIC     INORGANIC   ORGANIC     INORGANIC               TOTAL
                SUBM       02           02        C           C           C           C           C           C
                 ID       MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)             30(0)       2(1)       30(0)       30(1)                                           29(1)
           LOW             14.0        L1.0         7.6       L1.0                                              .33
          HIGH            587.8        23.5      1150.0      414.00                                           17.79
       AVERAGE            135.7        12.25*     151.20      52.47*                                           3.06*
      STD.DEV.            157.4        15.91*     283.16      78.65*                                           4.14*
  PERCNT:10TH              24.0                    15.00       6.80                                             .55
          25TH             39.0                    19.        15.                                              1.13
   MEDIAN 50TH             60.7        12.25*      44.50      34.50                                            2.10
          75TH            149.3                   119.0       55.                                              2.71
          90TH            433.0                   429.75      86.00                                            5.22
SECONDARY CODE

                          24101L      24009L      24302L      80015L      80011L      27009L      27302L      47304L
                          CHROMIUM    CHROMIUM    CHROMIUM    MERCURY     MERCURY     COBALT      COBALT      SILVER
                          HEXAVALENT  TOTAL       EXTRBLE.    TOTAL       TOTAL       TOTAL       EXTRBLE.    EXTRBLE.

                SUBM       CR          CR          CR          HG          HG          CO          CO          AG
                 ID       MG/L        MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            29(6)       30(0)                   29(26)                  30(0)
           LOW             L.001        .095                  L.0001                    .253
          HIGH              .620        .570                   .0007                   2.870
       AVERAGE              .134*       .255                   .0001*                  1.168
      STD.DEV.              .146*       .110                   .0001*                   .719
  PERCNT:10TH              L.001        .129                  L.0001                    .431
          25TH              .015        .161                  L.0001                    .665
   MEDIAN 50TH              .104        .237                  L.0001                    .949
          75TH              .193        .307                  L.0001                   1.510
          90TH              .302        .397                   .0003                   2.455
SECONDARY CODE

                          29009L      29305L      28009L      28302L      48009L      48302L      82009L      82302L
                          COPPER      COPPER      NICKEL      NICKEL      CADMIUM     CADMIUM     LEAD        LEAD
                          TOTAL       EXTRBLE.    TOTAL       EXTRBLE.    TOTAL       EXTRBLE.    TOTAL       EXTRBLE.

                SUBM       CU          CU          NI          NI          CD          CD          PB          PB
                 ID       MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            30(0)                   30(0)                   30(0)                   18(7)       11(5)
           LOW              .034                   1.520                    .002                  L.003       L.003
          HIGH              .675                  18.800                    .049                   .103        .039
       AVERAGE              .125                   7.088                    .009                   .013*       .012*
      STD.DEV.              .128                   3.769                    .009                   .023*       .012*
  PERCNT:10TH               .043                   3.220                    .003                  L.003       L.003
          25TH              .062                   4.840                    .005                  L.003       L.003
   MEDIAN 50TH              .090                   5.985                    .007                   .006        .006
          75TH              .136                   8.990                    .009                   .010        .020
          90TH              .202                  12.000                    .013                   .026        .026
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0010 -  0012 PAGE 144                        NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                         INDUSTRIAL MONITORING
STATION 20AL05EB5804    LAT. 53D 44M 10S  LONG. 113D 11M 35S   PR 3   UTM 12 355350E 5956150N  FOR NOV 18, 1981 TO MAY 29, 1984
SHERRITT GORDON MINES LTD FT SASK           STORM WATER POND EFFLUENT GRAB
RIVER LOT 7 FT SASK SETTLEMENT

                            30009L       30305L       25003L       25304L       23009L       42304L       42009L       51003L
                             ZINC         ZINC       MANGANESE    MANGANESE    VANADIUM    MOLYBDENUM   MOLYBDENUM    ANTIMONY
                             TOTAL      EXTRBLE.       TOTAL      EXTRBLE.       TOTAL      EXTRBLE.      TOTAL        TOTAL

                  SUBM        ZN           ZN           MN           MN           V            MO           MO           SB
                   ID        MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)              30(0)                     30(0)                     28(0)                     26(0)
           LOW               .075                      .014                      .007                      .005
          HIGH              5.470                     1.970                      .045                      .032
       AVERAGE              1.063                      .262                      .015                      .012
      STD.DEV.              1.306                      .364                      .009                      .006
   PERCNT:10TH               .158                      .050                      .008                      .008
          25TH               .309                      .089                      .010                      .009
   MEDIAN 50TH               .648                      .189                      .013                      .010
          75TH              1.080                      .291                      .017                      .013
          90TH              2.560                      .344                      .029                      .016
SECONDARY CODE
                            33005L       33104L       34005L       34102L       13111L       13306L       04102L       04304L
                            ARSENIC      ARSENIC      SELENIUM     SELENIUM     ALUMINUM     ALUMINUM     BERYLLIUM    BERYLLIUM
                            TOTAL       DISSOLVED     TOTAL       DISSOLVED    DISSOLVED     EXTRBLE.    DISSOLVED     EXTRBLE.

                  SUBM        AS           AS           SE           SE           AL           AL           BE           BE
                   ID        MG/L         MG/L         MG/L         MG/L         UG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)              15(0)                     15(2)                                  26(0)                     26(25)
           LOW              .0044                     L.0002                                  .025                     L.001
          HIGH              .2700                      .0027                                10.610                      .004
       AVERAGE              .0496                      .0010*                                1.298                      .001*
      STD.DEV.              .0652                      .0009*                                2.187                      .001*
   PERCNT:10TH              .0077                     L.0002                                  .070                     L.001
          25TH              .0174                      .0004                                  .240                     L.001
   MEDIAN 50TH              .0235                      .0005                                  .612                     L.001
          75TH              .0600                      .0016                                 1.300                     L.001
          90TH              .0750                      .0025                                 3.750                     L.001
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE 145                     NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                    INDUSTRIAL MONITORING
STATION 20AL05EB5805    LAT. 53D 44M 10S  LONG. 113D 11M 35S   PR 3   UTM 12 355350E 5956150N  FOR FEB 08, 1982 TO MAY 29, 1984
SHERRITT GORDON MINES LTD FT SASK         STORM WATER POND EFFLUENT COMP
RIVER LOT 7 FT SASK SETTLEMENT

                          02061F      10301L      10301F      10151L      10101L      02041L      97160S      97163S
                        TEMPERATURE     PH          PH      ALKALINITY  ALKALINITY   SPECIFIC   DISCHARGE   DISCHARGE
                         OF WATER                             PHENOL      TOTAL      CONDUCT.    INSTANT      DAILY
                                                            PHTHALEIN                                         MEAN
                   SUBM                                       CACO3       CACO3
                    ID     DEG.C      PH UNITS    PH UNITS    MG/L        MG/L        US/CM       M3/S        CFS
SAMPLES(FLAGS)              1(0)       10(0)       5(0)       9(0)       10(0)       10(0)                   11(0)
           LOW              14.0        6.2        7.0          .0         33.        3090.                    .59
          HIGH              14.0        9.50       7.9        15.0       3050.0       7140.                   1.662
       AVERAGE                                                 1.7        490.0       4999.                    .9562
      STD.DEV.                                                 5.0        905.4       1438.                    .3920
  PERCNT:10TH                           6.45                               62.0       3175.                    .59
          25TH                          7.1        7.1          .0        159.        3740.                    .600
   MEDIAN 50TH                          7.50       7.2          .0        222.0       5290.                    .80
          75TH                          7.9        7.5          .0        296.        6110.                   1.353
          90TH                          8.95                             1727.0       6760.                   1.365
SECONDARY CODE

                          06201L      06202L      06301L      20103L      20105L      10602L      10604L      97160S
                        BICARBONT.  BICARBONT.  CARBONATE    CALCIUM     CALCIUM    HARDNESS    HARDNESS   DISCHARGE
                         (CALCD.)    (CALCD.)    (CALCD.)   DISSOLVED   DISSOLVED     TOTAL       TOTAL      INSTANT
                                                                         (CALCD.)    (CALCD.)
                   SUBM    HCO3        HCO3        CO3         CA          CA         CACO3       CACO3
                    ID  MG/L           MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        M3/S
SAMPLES(FLAGS)              9(0)       1(0)        9(0)       10(0)                   10(0)
           LOW               40.        454.          0.        33.0                   197.7
          HIGH              456.        454.         18.       158.                    634.9
       AVERAGE              247.                      2.       115.2                   444.9
      STD.DEV.              126.                      6.        41.7                   144.8
  PERCNT:10TH                                                   52.5                   236.3
          25TH              194.                      0.        87.                    311.5
   MEDIAN 50TH              247.                      0.       128.5                   473.0
          75TH              301.                      0.       147.                    547.7
          90TH                                                 157.5                   613.5
SECONDARY CODE                                              10L

                          11103L      12102L      19103L      09107L      17203L      16306L      26009L      26304L
                          SODIUM    MAGNESIUM   POTASSIUM    FLUORIDE    CHLORIDE    SULPHATE      IRON        IRON
                        DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED     TOTAL      EXTRBLE.

                   SUBM    NA          MG          K           F           CL          SO4         FE          FE
                    ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)             10(0)       10(0)       10(0)       10(0)       10(0)       10(0)                   10(1)
           LOW             128.         14.         4.4        3.50        11.        1150.                   L.020
          HIGH             296.         59.        20.2       39.50       220.        2650.                   2.05
       AVERAGE             193.9        38.2       11.02      16.905        73.80     1678.0                    .415*
      STD.DEV.              58.9        13.7        5.23      11.399        65.16      497.5                    .598*
  PERCNT:10TH              128.5        21.0        4.55       5.250        15.50     1200.0                    .035*
          25TH             130.         30.         6.2        9.30        25.        1250.                    .10
   MEDIAN 50TH             191.5        37.0       10.85      12.100        58.50     1615.0                    .260
          75TH             214.0        48.        14.1       25.75       106.        1850.                    .39
          90TH             288.0        57.5       18.60      34.750       180.00     2475.0                   1.295
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE 146                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                  INDUSTRIAL MONITORING
STATION 20AL05EB5805    LAT. 53D 44M 10S  LONG. 113D 11M 35S   PR 3   UTM 12 355350E 5956150N  FOR FEB 08, 1982 TO MAY 29, 1984
SHERRITT GORDON MINES LTD FT SASK         STORM WATER POND EFFLUENT COMP
RIVER LOT 7 FT SASK SETTLEMENT

                         07105L        07205L        07562L        07021L        07906L        07905L        15421L        97160S
                        NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN    PHOSPHORUS     DISCHARGE
                        DISSOLVED     DISSOLVED     DISSOLVED      TOTAL      PARTICULATE   PARTICULATE     TOTAL         INSTANT
                        NO3 & NO2      NITRITE      AMMONIA       KJELDAHL       TOTAL        (CALCD.)
               SUBM        N             N             N             N             N             N             P
                ID        MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          M3/S
SAMPLES(FLAGS)            10(0)         10(0)         10(0)         10(0)          9(0)                       10(0)
           LOW            10.50           .25        144.00        164.00          .080                        1.400
          HIGH            82.000         2.44        1450.0        3275.0         3.91                        140.00
       AVERAGE            39.325         1.131       517.890       928.300        1.356                        52.950
      STD.DEV.            22.517          .685       374.679       956.576        1.321                        44.098
  PERCNT:10TH             12.500          .400       147.500       206.500                                      7.500
          25TH            22.50           .65        283.00        300.00          .3                          15.500
   MEDIAN 50TH            36.500          .950       472.450       675.000         .76                         40.625
          75TH            56.75          1.30        606.00        960.00         1.90                         82.500
          90TH            72.250         2.280       1042.00       2557.50                                     120.000
SECONDARY CODE                                       61L           15L                                         19L

                         10474L        10407L        10511L        10453L        14101L        97160S        97163S
                         RESIDUE       RESIDUE       RESIDUE       RESIDUE       SILICA       DISCHARGE     DISCHARGE
                          TOTAL     NONFILTRABLE    VOLATILE      FILTRABLE     REACTIVE       INSTANT        DAILY
                                                   NONFILTR.                                                 MEAN
               SUBM                                (CALCD.)                       SIO2
                ID        MG/L          MG/L          MG/L          MG/L          MG/L          M3/S          CFS
SAMPLES(FLAGS)            10(0)         10(0)                       10(0)         10(0)                       11(0)
           LOW            2257.          19.                        2230.          11.2                         .59
          HIGH            8589.          93.                        8510.          36.                         1.662
       AVERAGE            4154.5         53.5                       4102.0         20.97                        .9562
      STD.DEV.            1807.1         29.5                       1791.1          8.75                        .3920
  PERCNT:10TH             2398.0         19.0                       2380.0         11.50                        .59
          25TH            2792.          23.                        2730.          14.5                         .600
   MEDIAN 50TH            4117.5         57.5                       4035.0         17.10                        .80
          75TH            4528.8         79.                        4510.0         28.0                        1.353
          90TH            6783.5         90.5                       6700.0         33.50                       1.365
SECONDARY CODE                                                                  02L

                         00205L        02074L        06537L        06524L        02001L        16101L        10701L        06608L
                          TOTAL       TURBIDITY      PHENOLIC     OIL AND        ODOUR        SULPHIDE      SURFACT.       CYANIDE
                        DISSOLVED                    MATERIAL    GREASE        THRESHOLD     DISSOLVED      N-ALKYL
                         SOLIDS                                                 NUMBER                     SULPHNTS.
               SUBM                                  PHENOL                                      S            LAS            CN
                ID        MG/L          NTU           MG/L          MG/L          TON           MG/L          MG/L          MG/L
SAMPLES(FLAGS)            10(0)          9(0)          9(1)          9(0)                                      9(0)
           LOW            1640.           4.9          L.002          .4                                        .80
          HIGH            4139.7         84.0           .015         2.7                                      14.50
       AVERAGE            2850.2         38.8           .010*        1.511                                     7.633
      STD.DEV.             926.5         31.7           .004*         .804                                     4.561
  PERCNT:10TH             1643.0
          25TH            2158.           6.5           .008          .800                                     4.65
   MEDIAN 50TH            2793.5         30.0           .011         1.8                                       7.05
          75TH            3767.          62.0           .012         2.0                                      11.60
          90TH            4111.3
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE 147                       NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                     INDUSTRIAL MONITORING
STATION 20AL05EB5805    LAT. 53D 44M 10S  LONG. 113D 11M 35S   PR 3   UTM 12 355350E 5956150N  FOR FEB 08, 1982 TO MAY 29, 1984
SHERRITT GORDON MINES LTD FT SASK         STORM WATER POND EFFLUENT COMP
RIVER LOT 7 FT SASK SETTLEMENT

                        08304L      08202L      06107L      06154L      06001L      06051L      06006L      06905L
                        OXYGEN      OXYGEN      CARBON      CARBON      CARBON      CARBON      CARBON      CARBON
                          TOTAL     BIOCHEM.    DISSOLVED   DISSOLVED     TOTAL       TOTAL     TOTAL      PARTICULATE
                           COD      DEMAND-BOD  ORGANIC     INORGANIC   ORGANIC     INORGANIC                 TOTAL
                SUBM      02           02         C           C           C           C           C           C
                 ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           10(0)                   9(0)        9(0)                                            9(0)
           LOW            12.0                    9.90        5.                                              .75
          HIGH           484.0                   72.        174.80                                           11.45
       AVERAGE            93.3                   35.77       46.98                                            3.86
      STD.DEV.           140.8                   22.15       50.33                                            3.11
  PERCNT:10TH             19.5
          25TH            31.1                   18.         20.                                             2.
   MEDIAN 50TH            46.0                   39.         35.                                              3.31
          75TH            72.0                   50.         46.                                              4.19
          90TH           304.7
SECONDARY CODE

                        24101L      24009L      24302L      80015L      80011L      27009L      27302L      47304L
                        CHROMIUM    CHROMIUM    CHROMIUM    MERCURY     MERCURY     COBALT      COBALT      SILVER
                        HEXAVALENT  TOTAL        EXTRBLE.   TOTAL       TOTAL       TOTAL       EXTRBLE.    EXTRBLE.

                SUBM      CR          CR          CR          HG          HG          CO          CO          AG
                 ID     MG/L        MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           10(5)       10(0)                   9(6)                    10(0)
           LOW           L.001         .141                 L.0001                    .467
          HIGH            .445         .463                  .0013                   4.670
       AVERAGE            .095*        .276                  .0003*                  1.544
      STD.DEV.            .147*        .098                  .0004*                  1.262
  PERCNT:10TH            L.001         .146                                           .567
          25TH           L.001         .214                 L.0001                    .776
   MEDIAN 50TH            .001*        .273                 L.0001                   1.217
          75TH            .164         .317                  .0002                   1.550
          90TH            .328         .418                                          3.620
SECONDARY CODE

                        29009L      29305L      28009L      28302L      48009L      48302L      82009L      82302L
                        COPPER      COPPER      NICKEL      NICKEL      CADMIUM     CADMIUM     LEAD        LEAD
                         TOTAL      EXTRBLE.    TOTAL       EXTRBLE.    TOTAL       EXTRBLE.    TOTAL       EXTRBLE.

                SUBM      CU          CU          NI          NI          CD          CD          PB          PB
                 ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           10(0)                   9(0)                    10(0)                   8(1)        2(0)
           LOW            .025                    .600                    .003                   L.003        .024
          HIGH           2.640                  23.900                    .017                    .305        .028
       AVERAGE            .374                   7.849                    .008                    .051*       .026
      STD.DEV.            .800                   6.668                    .004                    .103*       .003
  PERCNT:10TH             .035                                            .004
          25TH            .083                   4.430                    .005                    .006
   MEDIAN 50TH            .102                   5.860                    .007                    .012        .026
          75TH            .242                   9.000                    .010                    .033
          90TH           1.450                                            .015
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0010 -  0012 PAGE 148                       NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                     INDUSTRIAL MONITORING
STATION 20AL05EB5805    LAT. 53D 44M 10S  LONG. 113D 11M 35S   PR 3   UTM 12 355350E 5956150N  FOR FEB 08, 1982 TO MAY 29, 1984
SHERRITT GORDON MINES LTD FT SASK          STORM WATER POND EFFLUENT COMP
RIVER LOT 7 FT SASK SETTLEMENT
                        30009L        30305L         25003L        25304L        23009L         42304L        42009L         51003L
                         ZINC           ZINC        MANGANESE     MANGANESE     VANADIUM       MOLYBDENUM   MOLYBDENUM      ANTIMONY
                        TOTAL         EXTRBLE.       TOTAL         EXTRBLE.      TOTAL          EXTRBLE.       TOTAL          TOTAL

                SUBM      ZN            ZN            MN             MN             V             MO            MO             SB
                 ID     MG/L           MG/L          MG/L           MG/L          MG/L           MG/L          MG/L           MG/L
SAMPLES(FLAGS)           10(0)                        10(0)                         9(1)                        9(0)
           LOW             .167                         .012                        L.002                        .009
          HIGH            4.470                         .552                         .029                        .017
       AVERAGE             .917                         .195                         .014*                       .013
      STD.DEV.            1.310                         .163                         .008*                       .002
   PERCNT:10TH             .169                         .035
          25TH             .217                         .066                         .011                        .011
   MEDIAN 50TH             .379                         .148                         .013                        .012
          75TH            1.050                         .266                         .016                        .014
          90TH            2.880                         .448
SECONDARY CODE
                        33005L        33104L         34005L        34102L          13111L       13306L        04102L         04304L
                        ARSENIC        ARSENIC      SELENIUM      SELENIUM       ALUMINUM       ALUMINUM     BERYLLIUM       BERYLLIUM
                       TOTAL         DISSOLVED     TOTAL          DISSOLVED      DISSOLVED      EXTRBLE.     DISSOLVED        EXTRBLE.

                SUBM      AS             AS            SE             SE            AL            AL             BE            BE
                 ID     MG/L           MG/L          MG/L           MG/L           UG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)            6(0)                         6(1)                                       9(0)                         9(9)
           LOW            .0047                       L.0002                                       .062                        L.001
          HIGH            .0405                        .0031                                       4.11                        L.001
       AVERAGE            .0181                        .0017*                                     1.867
      STD.DEV.            .0123                        .0012*                                     1.553
   PERCNT:10TH
          25TH            .0100                        .0004                                       .705                        L.001
   MEDIAN 50TH            .0171                        .0018                                      1.210                        L.001
          75TH             .019                        .0030                                      3.140                        L.001
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE 149                        NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                       INDUSTRIAL MONITORING
STATION 20AL05EB6200    LAT. 53D 43M 10S  LONG. 113D 10M 26S   PR 3   UTM 12 356550E 5954300N  FOR APR 20, 1983 TO JUL 17, 1984
THIO-PET CHEMICALS LTD FT SASK.          POND WATER GRAB
SE S3 T55 R22 W4M
                          02061F        10301L        10301F      10151L      10101L      02041L       97160S        97163S
                        TEMPERATURE       PH            PH      ALKALINITY  ALKALINITY   SPECIFIC    DISCHARGE     DISCHARGE
                        OF WATER                                   PHENOL      TOTAL     CONDUCT.     INSTANT        DAILY
                                                                PHTHALEIN                                             MEAN
                   SUBM                                            CACO3       CACO3
                    ID    DEG.C         PH UNITS      PH UNITS     MG/L        MG/L       US/CM          M3/S          CFS
SAMPLES(FLAGS)             3(0)           4(0)                      3(0)        4(0)       4(0)
           LOW              4.5           7.50                       .0         61.       1505.
          HIGH             21.0           7.90                       .0        114.       2860.
       AVERAGE             12.5                                      .0         90.3      2083.
      STD.DEV.              8.3                                      .0         26.3       625.
  PERCNT:10TH
          25TH                            7.65                                  68.2      1581.
   MEDIAN 50TH             12.0           7.80                       .0         93.2      1984.
          75TH                            7.85                                 112.5      2585.
          90TH
SECONDARY CODE
                          06201L        06202L        06301L      20103L      20105L      10602L       10604L        97160S
                        BICARBONT.    BICARBONT.    CARBONATE    CALCIUM     CALCIUM     HARDNESS     HARDNESS     DISCHARGE
                         (CALCD.)      (CALCD.)      (CALCD.)   DISSOLVED   DISSOLVED     TOTAL        TOTAL        INSTANT
                                                                            (CALCD.)     (CALCD.)
                   SUBM   HCO3          HCO3          CO3           CA          CA        CACO3         CACO3
                    ID   MG/L           MG/L          MG/L         MG/L        MG/L        MG/L         MG/L          M3/S
SAMPLES(FLAGS)             3(0)           3(0)         3(0)        4(0)                    4(0)
           LOW              74.            74.           0.       161.0                   690.2
          HIGH             139.           135.           0.       275.0                  1312.5
       AVERAGE             102.           100.           0.       211.5                   952.2
      STD.DEV.              33.            32.           0.        55.1                   274.8
  PERCNT:10TH
          25TH                                                    165.5                   742.6
   MEDIAN 50TH              92.            92.           0.       205.0                   903.0
          75TH                                                    257.5                  1161.7
          90TH
SECONDARY CODE                                                 10L
                          11103L        12102L        19103L      09107L      17203L      16306L       26009L        26304L
                          SODIUM      MAGNESIUM     POTASSIUM    FLUORIDE    CHLORIDE    SULPHATE       IRON          IRON
                        DISSOLVED     DISSOLVED     DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED      TOTAL        EXTRBLE.

                   SUBM    NA            MG            K            F           CL          SO4          FE            FE
                    ID    MG/L          MG/L          MG/L         MG/L        MG/L        MG/L         MG/L          MG/L
SAMPLES(FLAGS)             4(0)           4(0)         4(0)        4(0)        4(0)        4(0)                        4(1)
           LOW             51.0           70.0          7.9        .710         13.       600.0                       L.020
          HIGH            110.0          152.0         14.50        .96         52.      1290.0                         .33
       AVERAGE             83.5          103.0         11.72        .843       36.25      925.0                        .150*
      STD.DEV.             29.5           35.0          3.04        .117       17.21      328.5                        .135*
  PERCNT:10TH
          25TH             58.5           80.0          9.30        .745       23.50      650.0                        .050*
   MEDIAN 50TH             86.5           95.0         12.25        .850       40.00      905.0                        .125
          75TH            108.5          126.0         14.15        .940       49.00     1200.0                        .250
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE 150                          NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                         INDUSTRIAL MONITORING
STATION 20AL05EB6200    LAT. 53D 43M 10S  LONG. 113D 10M 26S   PR 3   UTM 12 356550E 5954300N  FOR APR 20, 1983 TO JUL 17, 1984
THIO-PET CHEMICALS LTD FT SASK.           POND WATER GRAB
SE S3 T55 R22 W4M

                       07105L      07205L      07562L      07021L      07906L        07905L        15421L      97160S
                      NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN      NITROGEN      PHOSPHORUS  DISCHARGE
                      DISSOLVED   DISSOLVED   DISSOLVED    TOTAL     PARTICULATE   PARTICULATE     TOTAL       INSTANT
                      NO3 & NO2   NITRITE     AMMONIA     KJELDAHL      TOTAL        (CALCD.)
                SUBM     N           N           N           N            N             N             P
                 ID     MG/L        MG/L        MG/L        MG/L         MG/L          MG/L          MG/L        M3/S
SAMPLES(FLAGS)          4(0)        4(0)        4(0)        4(0)         4(0)                        4(0)
           LOW          1.92        .17         1.130       4.300        .10                         .062
          HIGH         10.200       .520       10.400      15.200        .65                         .310
       AVERAGE          6.793       .325        4.465       8.150        .378                        .181
      STD.DEV.          3.774       .145        4.367       5.142        .264                        .103
  PERCNT:10TH
          25TH          3.835       .235        1.180       4.325        .155                        .106
   MEDIAN 50TH          7.525       .305        3.165       6.550        .380                        .175
          75TH          9.750       .415        7.750      11.975        .600                        .255
          90TH
SECONDARY CODE

                       10474L      10407L      10511L      10453L      14101L        97160S        97163S
                       RESIDUE     RESIDUE     RESIDUE     RESIDUE     SILICA       DISCHARGE     DISCHARGE
                        TOTAL    NONFILTRABLE  VOLATILE   FILTRABLE    REACTIVE       INSTANT        DAILY
                                              NONFILTR.                                              MEAN
                SUBM                          (CALCD.)                  SIO2
                 ID     MG/L        MG/L        MG/L        MG/L        MG/L          M3/S           CFS
SAMPLES(FLAGS)          4(0)        4(0)                    4(0)        4(0)
           LOW         1388.0       7.                     1360.0        .7
          HIGH         2682.0       28.0                   2670.0        3.9
       AVERAGE         1928.8       17.5                   1912.5        2.15
      STD.DEV.          610.9       8.6                     617.8        1.38
  PERCNT:10TH
          25TH         1433.0       12.0                   1410.0        1.10
   MEDIAN 50TH         1822.5       17.5                   1810.0        2.00
          75TH         2424.5       23.0                   2415.0        3.20
          90TH
SECONDARY CODE                                                           02L

                       00205L      02074L      06537L      06524L      02001L        16101L        10701L       06608L
                        TOTAL     TURBIDITY    PHENOLIC    OIL AND     ODOUR        SULPHIDE       SURFACT.      CYANIDE
                      DISSOLVED                MATERIAL    GREASE     THRESHOLD     DISSOLVED      N-ALKYL
                       SOLIDS                                          NUMBER                      SULPHNTS.
                SUBM                           PHENOL                                  S             LAS          CN
                 ID     MG/L        NTU         MG/L        MG/L         TON          MG/L          MG/L         MG/L
SAMPLES(FLAGS)          4(0)        2(0)        4(0)        4(0)                                    1(0)
           LOW         1009.0       1.5         .008        .320                                    .30
          HIGH         1986.8       2.5         .027        .700                                    .30
       AVERAGE         1394.2       2.0         .015        .580
      STD.DEV.          428.4       .7          .009        .180
  PERCNT:10TH
          25TH         1089.0                   .009        .460
   MEDIAN 50TH         1290.5       2.0         .013        .650
          75TH         1699.4                   .022        .700
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE 151                     NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB6200    LAT. 53D 43M 10S  LONG. 113D 10M 26S   PR 3   UTM 12 356550E 5954300N  FOR APR 20, 1983 TO JUL 17, 1984
THIO-PET CHEMICALS LTD FT SASK.           POND WATER GRAB
SE S3 T55 R22 W4M

                       08304L        08202L        06107L        06154L        06001L        06051L        06006L        06905L
                       OXYGEN        OXYGEN        CARBON        CARBON        CARBON        CARBON        CARBON        CARBON
                         TOTAL       BIOCHEM.     DISSOLVED     DISSOLVED       TOTAL         TOTAL      TOTAL         PARTICULATE
                          COD      DEMAND-BOD      ORGANIC      INORGANIC      ORGANIC      INORGANIC                    TOTAL
               SUBM      02              02          C             C             C             C             C             C
                ID    MG/L            MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)          4(0)          1(0)           4(0)          4(0)                                                   4(0)
           LOW            37.4         15.0           9.7          12.8                                                     .95
          HIGH            77.2         15.0          19.0          26.0                                                    3.30
       AVERAGE            55.4                      14.67         20.32                                                    2.13
      STD.DEV.            16.5                       4.25          6.37                                                    1.26
  PERCNT:10TH
          25TH            44.3                      11.20         15.05                                                    1.04
   MEDIAN 50TH            53.5                      15.00         21.25                                                    2.13
          75TH            66.5                      18.15         25.60                                                    3.21
          90TH
SECONDARY CODE

                       24101L        24009L        24302L        80015L        80011L        27009L        27302L        47304L
                      CHROMIUM      CHROMIUM      CHROMIUM       MERCURY       MERCURY       COBALT        COBALT        SILVER
                     HEXAVALENT      TOTAL         EXTRBLE.      TOTAL         TOTAL         TOTAL         EXTRBLE.     EXTRBLE.

               SUBM     CR            CR            CR            HG            HG            CO            CO            AG
                ID    MG/L            MG/L          MG/L          MG/L          UG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)          4(4)          4(0)                         4(4)                        4(0)
           LOW           L.001          .009                      L.0001                        .013
          HIGH           L.001          .012                      L.0001                        .098
       AVERAGE                          .011                                                    .052
      STD.DEV.                          .001                                                    .035
  PERCNT:10TH
          25TH           L.001          .010                      L.0001                        .028
   MEDIAN 50TH           L.001          .011                      L.0001                        .048
          75TH           L.001          .012                      L.0001                        .076
          90TH
SECONDARY CODE

                       29009L        29305L        28009L        28302L        48009L        48302L        82009L        82302L
                       COPPER        COPPER        NICKEL        NICKEL        CADMIUM       CADMIUM        LEAD           LEAD
                        TOTAL        EXTRBLE.      TOTAL         EXTRBLE.      TOTAL         EXTRBLE.      TOTAL        EXTRBLE.

               SUBM     CU            CU            NI            NI            CD            CD            PB            PB
                ID    MG/L            MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)          4(0)                         4(0)                        4(0)                        1(1)          3(2)
           LOW            .005                        .234                        .002                       L.003         L.003
          HIGH            .016                        .883                        .005                       L.003          .004
       AVERAGE            .011                        .499                        .004                                      .003*
      STD.DEV.            .005                        .283                        .001                                      .001*
  PERCNT:10TH
          25TH            .008                        .292                        .003
   MEDIAN 50TH            .011                        .439                        .004                                     L.003
          75TH            .014                        .705                        .005
          90TH
SECONDARY CODE
```

```
REQUEST 0010 -  0012 PAGE 152                   NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                 INDUSTRIAL MONITORING
STATION 20AL05EB6200     LAT. 53D 43M 10S  LONG. 113D 10M 26S   PR 3   UTM 12 356550E 5954300N  FOR APR 20, 1983 TO JUL 17, 1984
THIO-PET CHEMICALS LTD FT SASK.          POND WATER GRAB
SE S3 T55 R22 W4M

                         30009L       30305L       25003L       25304L       23009L       42304L       42009L       51003L
                          ZINC         ZINC       MANGANESE    MANGANESE    VANADIUM    MOLYBDENUM   MOLYBDENUM   ANTIMONY
                         TOTAL       EXTRBLE.      TOTAL       EXTRBLE.      TOTAL       EXTRBLE.      TOTAL        TOTAL

                SUBM      ZN           ZN           MN           MN           V            MO           MO           SB
                 ID      MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)           4(0)                      4(0)                      4(0)                      4(0)
           LOW           .002                      .090                      .007                      .006
          HIGH           .012                      .439                      .016                      .025
       AVERAGE           .008                      .296                      .012                      .014
      STD.DEV.           .005                      .164                      .004                      .008
  PERCNT:10TH
          25TH           .005                      .164                      .009                      .008
   MEDIAN 50TH           .009                      .328                      .012                      .012
          75TH           .012                      .429                      .014                      .020
          90TH
SECONDARY CODE

                         33005L       33104L       34005L       34102L       13111L       13306L       04102L       04304L
                         ARSENIC      ARSENIC     SELENIUM     SELENIUM     ALUMINUM     ALUMINUM    BERYLLIUM    BERYLLIUM
                         TOTAL       DISSOLVED    TOTAL        DISSOLVED    DISSOLVED    EXTRBLE.    DISSOLVED     EXTRBLE.

                SUBM      AS           AS           SE           SE           AL           AL           BE           BE
                 ID      MG/L         MG/L         MG/L         MG/L         UG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)           3(0)                      2(2)                                   4(1)                      4(4)
           LOW           .0003                     L.0002                                 L.020                     L.001
          HIGH           .0009                     L.0002                                 .096                      L.001
       AVERAGE           .0006                                                            .045*
      STD.DEV.           .0003                                                            .035*
  PERCNT:10TH
          25TH                                                                            .022*                     L.001
   MEDIAN 50TH           .0007                     L.0002                                 .032                      L.001
          75TH                                                                            .067                      L.001
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE 153                       NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                      INDUSTRIAL MONITORING
STATION 20AL05EB6403    LAT. 53D 43M 26S  LONG. 113D 10M 27S   PR 3   UTM 12 356550E 5954800N  FOR FEB 16, 1983 TO JUL 18, 1984
UNION CARBIDE CANADA LTD FT SASK           COOLING WATER GRAB
SW S3 T55 R22 W4M

                        02061F        10301L        10301F       10151L        10101L       02041L        97160S        97163S
                      TEMPERATURE       PH            PH        ALKALINITY    ALKALINITY    SPECIFIC     DISCHARGE     DISCHARGE
                       OF WATER                                   PHENOL        TOTAL      CONDUCT.      INSTANT        DAILY
                                                                PHTHALEIN                                                MEAN
                SUBM                                              CACO3         CACO3
                 ID     DEG.C        PH UNITS      PH UNITS       MG/L          MG/L         US/CM         M3/S          CFS
SAMPLES(FLAGS)            8(0)          8(0)                      8(1)          8(0)         8(0)                       3(0)
           LOW            11.5          7.6                         .0           86.         1481.                      .035
          HIGH            21.0          8.50                      13.3          307.         1892.                      .05
       AVERAGE            15.8                                     4.2*         213.8        1706.                      .0417
      STD.DEV.             3.0                                     5.1*          76.4         144.                      .0076
   PERCNT:10TH
          25TH            13.5          7.90                        .0          160.0        1594.
   MEDIAN 50TH            16.5          8.35                       2.1*         223.3        1727.                      .04
          75TH            17.0          8.40                       8.0          275.3        1818.
          90TH
SECONDARY CODE

                        06201L        06202L        06301L       20103L        20105L       10602L        10604L        97160S
                      BICARBONT.    BICARBONT.    CARBONATE     CALCIUM       CALCIUM      HARDNESS      HARDNESS     DISCHARGE
                       (CALCD.)      (CALCD.)      (CALCD.)    DISSOLVED     DISSOLVED      TOTAL         TOTAL        INSTANT
                                                                              (CALCD.)     (CALCD.)
                SUBM     HCO3          HCO3          CO3          CA            CA          CACO3         CACO3
                 ID     MG/L           MG/L          MG/L         MG/L          MG/L         MG/L          MG/L          M3/S
SAMPLES(FLAGS)            8(1)          5(0)          8(1)         8(0)          1(0)         8(0)
           LOW            105.          207.            0.         202.0         236.2        739.1
          HIGH            352.          331.           16.         285.          236.2       1028.7
       AVERAGE            250.*         273.            5.*        238.8                      882.8
      STD.DEV.             84.*          50.            6.*         26.4                       91.7
   PERCNT:10TH
          25TH            195.          235.            0.         220.5                      838.8
   MEDIAN 50TH            263.          291.            3.         238.5                      873.4
          75TH            316.          300.           10.         252.5                      935.2
          90TH
SECONDARY CODE                                                   10L

                        11103L        12102L        19103L       09107L        17203L       16306L        26009L        26304L
                        SODIUM       MAGNESIUM     POTASSIUM    FLUORIDE      CHLORIDE     SULPHATE        IRON          IRON
                       DISSOLVED     DISSOLVED     DISSOLVED    DISSOLVED     DISSOLVED    DISSOLVED       TOTAL       EXTRBLE.

                SUBM      NA            MG             K            F             CL          SO4            FE            FE
                 ID      MG/L          MG/L          MG/L         MG/L          MG/L         MG/L          MG/L          MG/L
SAMPLES(FLAGS)            8(0)          8(0)          8(0)         8(0)          8(0)         8(0)                       8(0)
           LOW            32.           57.0           4.9          .23           51.         390.0                      .500
          HIGH            58.           80.           16.2         1.06         145.00        750.                      1.67
       AVERAGE            43.9          69.6           8.92         .711        100.88        620.3                      .965
      STD.DEV.            10.0           7.1           3.58         .246         30.75        136.9                      .423
   PERCNT:10TH
          25TH            35.5          66.5           6.15         .630         80.00        513.5                      .540
   MEDIAN 50TH            42.0          68.5           9.00         .735        105.50        675.0                      .975
          75TH            53.0          75.0          10.00         .835        120.00        722.5                     1.260
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE 154                          NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                         INDUSTRIAL MONITORING
STATION 20AL05EB6403    LAT. 53D 43M 26S  LONG. 113D 10M 27S   PR 3   UTM 12 356550E 5954800N  FOR FEB 16, 1983 TO JUL 18, 1984
UNION CARBIDE CANADA LTD FT SASK          COOLING WATER GRAB
SW S3 T55 R22 W4M
                         07105L      07205L      07562L      07021L      07906L      07905L      15421L      97160S
                        NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN   PHOSPHORUS  DISCHARGE
                        DISSOLVED   DISSOLVED   DISSOLVED    TOTAL    PARTICULATE PARTICULATE   TOTAL       INSTANT
                        NO3 & NO2   NITRITE     AMMONIA     KJELDAHL    TOTAL       (CALCD.)
                  SUBM     N           N           N           N           N           N           P
                   ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        M3/S
SAMPLES(FLAGS)            8(0)        8(4)        8(0)        8(0)        8(1)                    8(0)
           LOW            1.93        L.05        .028       1.020        L.01                   1.200
          HIGH            7.20         .88      13.100      15.250        .640                   3.960
       AVERAGE            5.293       .171*      3.050       5.285        .314*                  1.817
      STD.DEV.            1.896       .288*      4.884       5.596        .234*                   .915
   PERCNT:10TH
          25TH            3.880      L.050        .165       1.680        .065                   1.290
   MEDIAN 50TH            5.750       .060*       .460       2.525        .410                   1.455
          75TH            6.975       .110       5.010       8.800        .455                   1.945
          90TH
SECONDARY CODE

                         10474L      10407L      10511L      10453L      14101L      97160S      97163S
                        RESIDUE     RESIDUE     RESIDUE     RESIDUE     SILICA     DISCHARGE   DISCHARGE
                         TOTAL    NONFILTRABLE  VOLATILE   FILTRABLE   REACTIVE     INSTANT      DAILY
                                               NONFILTR.                                         MEAN
                  SUBM                          (CALCD.)                 SIO2
                   ID    MG/L        MG/L        MG/L        MG/L        MG/L        M3/S        CFS
SAMPLES(FLAGS)           8(0)        8(0)                    8(0)        8(0)                    3(0)
           LOW          1423.0        23.0                  1400.        10.7                    .035
          HIGH          1974.         58.0                  1920.        21.4                    .05
       AVERAGE          1623.1        41.9                  1581.3       16.79                   .0417
      STD.DEV.           193.6        15.3                   185.0        4.34                   .0076
   PERCNT:10TH
          25TH          1468.5        24.0                  1430.0       12.85
   MEDIAN 50TH          1561.0        49.5                  1520.0       17.35                   .04
          75TH          1764.5        53.5                  1715.0       20.90
          90TH
SECONDARY CODE                                                          02L

                         00205L      02074L      06537L      06524L      02001L      16101L      10701L      06608L
                         TOTAL     TURBIDITY    PHENOLIC    OIL AND      ODOUR     SULPHIDE    SURFACT.     CYANIDE
                        DISSOLVED               MATERIAL    GREASE     THRESHOLD   DISSOLVED   N-ALKYL
                         SOLIDS                                          NUMBER                SULPHNTS.
                  SUBM                          PHENOL                                S          LAS         CN
                   ID    MG/L        NTU         MG/L        MG/L         TON        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           8(0)        2(0)        8(0)        8(0)                                            3(0)
           LOW           990.2        25.0        .005        .300                                           .004
          HIGH          1442.         35.0        .019        .7                                             .045
       AVERAGE          1234.1        30.0        .012        .513                                           .0273
      STD.DEV.           157.2         7.1        .004        .136                                           .0211
   PERCNT:10TH
          25TH          1108.3                    .010        .400
   MEDIAN 50TH          1264.5        30.0        .013        .550                                           .033
          75TH          1347.5                    .015        .600
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE 155                      NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                    INDUSTRIAL MONITORING
STATION 20AL05EB6403    LAT. 53D 43M 26S  LONG. 113D 10M 27S   PR 3   UTM 12 356550E 5954800N  FOR FEB 16, 1983 TO JUL 18, 1984
UNION CARBIDE CANADA LTD FT SASK          COOLING WATER GRAB
SW S3 T55 R22 W4M

                     08304L      08202L      06107L      06154L      06001L      06051L      06006L      06905L
                     OXYGEN      OXYGEN      CARBON      CARBON      CARBON      CARBON      CARBON      CARBON
                      TOTAL     BIOCHEM.    DISSOLVED   DISSOLVED     TOTAL       TOTAL     TOTAL      PARTICULATE
                       COD     DEMAND-BOD    ORGANIC    INORGANIC    ORGANIC    INORGANIC                TOTAL
              SUBM     O2          O2          C           C           C           C           C           C
               ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)        8(0)        3(0)        8(0)        8(0)                                            8(1)
           LOW         6.1         2.8        10.2        18.0                                            L.01
          HIGH        93.2        11.4        33.0        72.0                                            5.28
       AVERAGE        55.5        7.23       21.59       48.26                                            2.91*
      STD.DEV.        31.3        4.31        9.40       18.65                                            1.89*
   PERCNT:10TH
          25TH        38.7                   13.75       34.50                                            1.25
   MEDIAN 50TH        45.2         7.5       19.50       49.95                                            3.25
          75TH        88.4                   31.50       63.60                                            4.50
          90TH
SECONDARY CODE

                     24101L      24009L      24302L      80015L      80011L      27009L      27302L      47304L
                    CHROMIUM    CHROMIUM    CHROMIUM    MERCURY     MERCURY     COBALT      COBALT      SILVER
                   HEXAVALENT   TOTAL       EXTRBLE.    TOTAL       TOTAL       TOTAL       EXTRBLE.    EXTRBLE.

              SUBM     CR          CR          CR          HG          HG          CO          CO          AG
               ID     MG/L        MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)        5(5)        8(0)                    8(8)                    8(0)
           LOW        L.001       .012                    L.0001                  .005
          HIGH        L.001       .018                    L.0001                  .008
       AVERAGE                    .015                                            .007
      STD.DEV.                    .002                                            .001
   PERCNT:10TH
          25TH        L.001       .013                    L.0001                  .006
   MEDIAN 50TH        L.001       .015                    L.0001                  .006
          75TH        L.001       .017                    L.0001                  .008
          90TH
SECONDARY CODE

                     29009L      29305L      28009L      28302L      48009L      48302L      82009L      82302L
                     COPPER      COPPER      NICKEL      NICKEL      CADMIUM     CADMIUM      LEAD        LEAD
                     TOTAL       EXTRBLE.    TOTAL       EXTRBLE.    TOTAL       EXTRBLE.    TOTAL       EXTRBLE.

              SUBM     CU          CU          NI          NI          CD          CD          PB          PB
               ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)        8(0)                    8(0)                    8(0)                                7(1)
           LOW        .028                    .003                    .002                                L.003
          HIGH        .155                    .050                    .008                                .010
       AVERAGE        .073                    .026                    .005                                .006*
      STD.DEV.        .052                    .014                    .002                                .002*
   PERCNT:10TH
          25TH        .034                    .021                    .004                                .004
   MEDIAN 50TH        .042                    .025                    .004                                .006
          75TH        .124                    .032                    .006                                .008
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0010 -  0012 PAGE 156                        NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                      INDUSTRIAL MONITORING
STATION 20AL05EB6403    LAT. 53D 43M 26S  LONG. 113D 10M 27S   PR 3   UTM 12 356550E 5954800N  FOR FEB 16, 1983 TO JUL 18, 1984
UNION CARBIDE CANADA LTD FT SASK          COOLING WATER GRAB
SW S3 T55 R22 W4M

                         30009L       30305L        25003L       25304L       23009L       42304L       42009L       51003L
                          ZINC         ZINC        MANGANESE    MANGANESE    VANADIUM    MOLYBDENUM   MOLYBDENUM    ANTIMONY
                          TOTAL       EXTRBLE.      TOTAL        EXTRBLE.     TOTAL       EXTRBLE.      TOTAL        TOTAL

                 SUBM      ZN           ZN           MN           MN           V            MO           MO           SB
                  ID       MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)             8(0)                      8(0)                      8(0)                      8(0)
          LOW               .076                      .040                      .008                      .005
         HIGH               .625                      .094                      .014                      .012
      AVERAGE               .247                      .069                      .011                      .009
     STD.DEV.               .175                      .021                      .002                      .003
  PERCNT:10TH
         25TH               .150                      .052                      .010                      .007
  MEDIAN 50TH               .195                      .067                      .011                      .008
         75TH               .292                      .090                      .013                      .012
         90TH
SECONDARY CODE

                         33005L       33104L       34005L       34102L       13111L       13306L       04102L       04304L
                         ARSENIC      ARSENIC      SELENIUM     SELENIUM     ALUMINUM     ALUMINUM     BERYLLIUM    BERYLLIUM
                         TOTAL        DISSOLVED    TOTAL        DISSOLVED    DISSOLVED    EXTRBLE.     DISSOLVED     EXTRBLE.

                 SUBM      AS           AS           SE           SE           AL           AL           BE           BE
                  ID       MG/L         MG/L         MG/L         MG/L         UG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)             6(0)                      5(5)                                   8(0)                      8(8)
          LOW              .0470                     L.0002                                  .130                     L.001
         HIGH              .0800                     L.0002                                 2.000                     L.001
      AVERAGE              .0698                                                            1.210
     STD.DEV.              .0124                                                             .762
  PERCNT:10TH
         25TH              .0670                     L.0002                                  .446                     L.001
  MEDIAN 50TH              .0725                     L.0002                                 1.415                     L.001
         75TH              .0800                     L.0002                                 1.915                     L.001
         90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

NAQUADAT SUMMARY REPORT JAN 08, 1986
INDUSTRIAL MONITORING

STATION 20AL05EB6404 LAT. 53D 43M 26S LONG. 113D 10M 27S PR 3 UTM 12 356550E 5954800N FOR JUL 27, 1983 TO JUL 17, 1984
UNION CARBIDE CANADA LTD FT SASK COOLING WATER COMP.
SW S3 T55 R22 W4M

SUBM ID	02061F TEMPERATURE OF WATER	10301L PH	10301F PH	10151L ALKALINITY PHENOL PHTHALEIN	10101L ALKALINITY TOTAL	02041L SPECIFIC CONDUCT.	97160S DISCHARGE INSTANT	97163S DISCHARGE DAILY MEAN
	DEG.C	PH UNITS	PH UNITS	CACO3 MG/L	CACO3 MG/L	US/CM	M3/S	CFS
SAMPLES(FLAGS)		2(0)		2(0)	2(0)	2(0)		1(0)
LOW		7.9		.0	166.	1600.		.07
HIGH		8.60		18.0	295.9	1815.		.07
AVERAGE				9.0	230.9	1708.		
STD.DEV.				12.7	91.8	152.		
PERCNT:10TH								
25TH								
MEDIAN 50TH		8.25		9.0	230.9	1708.		
75TH								
90TH								
SECONDARY CODE								

SUBM ID	06201L BICARBONT. (CALCD.)	06202L BICARBONT. (CALCD.)	06301L CARBONATE (CALCD.)	20103L CALCIUM DISSOLVED	20105L CALCIUM DISSOLVED (CALCD.)	10602L HARDNESS TOTAL (CALCD.)	10604L HARDNESS TOTAL	97160S DISCHARGE INSTANT
	HCO3 MG/L	HCO3 MG/L	CO3 MG/L	CA MG/L	CA MG/L	CACO3 MG/L	CACO3 MG/L	M3/S
SAMPLES(FLAGS)	2(0)	1(0)	2(0)	2(0)	1(0)	2(0)		
LOW	202.	317.	0.	225.	241.5	841.8		
HIGH	317.	317.	22.	242.0	241.5	884.2		
AVERAGE	260.		11.	233.5		863.0		
STD.DEV.	81.		15.	12.0		30.0		
PERCNT:10TH								
25TH								
MEDIAN 50TH	260.		11.	233.5		863.0		
75TH								
90TH								
SECONDARY CODE				10L				

SUBM ID	11103L SODIUM DISSOLVED	12102L MAGNESIUM DISSOLVED	19103L POTASSIUM DISSOLVED	09107L FLUORIDE DISSOLVED	17203L CHLORIDE DISSOLVED	16306L SULPHATE DISSOLVED	26009L IRON TOTAL	26304L IRON EXTRBLE.
	NA MG/L	MG MG/L	K MG/L	F MG/L	CL MG/L	SO4 MG/L	FE MG/L	FE MG/L
SAMPLES(FLAGS)	2(0)	2(0)	2(0)	2(0)	2(0)	2(0)		2(0)
LOW	35.0	68.	5.10	.740	108.	400.0		.540
HIGH	54.	68.0	10.5	.75	145.00	700.		1.15
AVERAGE	44.5	68.0	7.80	.745	126.50	550.0		.845
STD.DEV.	13.4	.0	3.82	.007	26.16	212.1		.431
PERCNT:10TH								
25TH								
MEDIAN 50TH	44.5	68.0	7.80	.745	126.50	550.0		.845
75TH								
90TH								
SECONDARY CODE								

* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q

```
REQUEST 0004 -  0006 PAGE 158                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                      INDUSTRIAL MONITORING
STATION 20AL05EB6404    LAT. 53D 43M 26S  LONG. 113D 10M 27S   PR 3   UTM 12 356550E 5954800N  FOR JUL 27, 1983 TO JUL 17, 1984
UNION CARBIDE CANADA LTD FT SASK          COOLING WATER COMP.
SW S3 T55 R22 W4M

                          07105L      07205L      07562L      07021L      07906L       07905L      15421L      97160S
                         NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN     NITROGEN    PHOSPHORUS  DISCHARGE
                         DISSOLVED   DISSOLVED   DISSOLVED     TOTAL    PARTICULATE  PARTICULATE    TOTAL      INSTANT
                         NO3 & NO2    NITRITE     AMMONIA     KJELDAHL     TOTAL       (CALCD.)
                 SUBM        N           N           N           N           N            N           P
                  ID       MG/L        MG/L        MG/L        MG/L        MG/L         MG/L        MG/L        M3/S
SAMPLES(FLAGS)             2(0)        2(0)        2(0)        2(0)        2(0)                     2(0)
           LOW             6.75        .130       1.680       3.000        .360                    1.380
          HIGH             7.050       .85       10.500      12.400        .61                     1.530
       AVERAGE             6.900       .490       6.090       7.700        .485                    1.455
      STD.DEV.              .212       .509       6.237       6.647        .177                     .106
  PERCNT:10TH
          25TH
   MEDIAN 50TH             6.900       .490       6.090       7.700        .485                    1.455
          75TH
          90TH
SECONDARY CODE

                          10474L      10407L       10511L      10453L      14101L       97160S      97163S
                          RESIDUE     RESIDUE      RESIDUE     RESIDUE     SILICA      DISCHARGE   DISCHARGF
                           TOTAL   NONFILTRABLE   VOLATILE    FILTRABLE   REACTIVE      INSTANT      DAILY
                                                 NONFILTR.                                           MEAN
                 SUBM                            (CALCD.)                   SIO2
                  ID       MG/L        MG/L        MG/L        MG/L        MG/L          M3/S        CFS
SAMPLES(FLAGS)             2(0)        2(0)                    2(0)        2(0)                     1(0)
           LOW            1612.0       52.0                   1560.0       11.70                     .07
          HIGH            1866.        56.                    1810.        18.9                      .07
       AVERAGE            1739.0       54.0                   1685.0       15.30
      STD.DEV.             179.6        2.8                    176.8        5.09
  PERCNT:10TH
          25TH
   MEDIAN 50TH            1739.0       54.0                   1685.0       15.30
          75TH
          90TH
SECONDARY CODE                                                            02L

                          00205L      02074L      06537L      06524L       02001L      16101L      10701L      06608L
                           TOTAL     TURBIDITY    PHENOLIC    OIL AND       ODOUR      SULPHIDE    SURFACT.     CYANIDE
                         DISSOLVED                MATERIAL    GREASE      THRESHOLD   DISSOLVED    N-ALKYL
                          SOLIDS                                           NUMBER                 SULPHNTS.
                 SUBM                              PHENOL                                  S          LAS         CN
                  ID       MG/L        NTU         MG/L        MG/L          TON         MG/L        MG/L        MG/L
SAMPLES(FLAGS)             2(0)        1(0)        2(0)        2(0)
           LOW            1103.7       35.0        .011        .300
          HIGH            1295.        35.0        .016       1.1
       AVERAGE            1199.3                   .014        .700
      STD.DEV.             135.3                   .004        .566
  PERCNT:10TH
          25TH
   MEDIAN 50TH            1199.3                   .014        .700
          75TH
          90TH
SECONDARY CODE
```

```
REQUEST 0007 -  0009 PAGE 159
                                                      NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                        INDUSTRIAL MONITORING
STATION 20AL05EB6404    LAT. 53D 43M 26S  LONG. 113D 10M 27S   PR 3   UTM 12 356550E 5954800N  FOR JUL 27, 1983 TO JUL 17, 1984
UNION CARBIDE CANADA LTD FT SASK          COOLING WATER COMP.
SW S3 T55 R22 W4M

                        08304L      08202L      06107L      06154L      06001L      06051L      06006L      06905L
                        OXYGEN      OXYGEN      CARBON      CARBON      CARBON      CARBON      CARBON      CARBON
                         TOTAL     BIOCHEM.   DISSOLVED   DISSOLVED     TOTAL       TOTAL      TOTAL     PARTICULATE
                          COD     DEMAND-BOD   ORGANIC    INORGANIC    ORGANIC    INORGANIC                 TOTAL
                  SUBM    02          02          C           C           C           C           C           C
                   ID    MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            2(0)                    2(0)        2(0)                                            2(0)
           LOW            44.5                   15.20        36.0                                            2.41
          HIGH            86.8                    29.0       68.40                                            5.96
       AVERAGE            65.6                   22.10       52.20                                            4.18
      STD.DEV.            29.9                    9.76       22.91                                            2.51
   PERCNT:10TH
          25TH
   MEDIAN 50TH            65.6                   22.10       52.20                                            4.18
          75TH
          90TH
SECONDARY CODE

                        24101L      24009L      24302L      80015L      80011L      27009L      27302L      47304L
                       CHROMIUM    CHROMIUM    CHROMIUM    MERCURY     MERCURY     COBALT      COBALT      SILVER
                      HEXAVALENT    TOTAL      EXTRBLE.     TOTAL       TOTAL       TOTAL      EXTRBLE.    EXTRBLE.
                  SUBM    CR          CR          CR          HG          HG          CO          CO          AG
                   ID    MG/L        MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)                        2(0)                    2(2)                    2(0)
           LOW                        .012                  L.0001                    .006
          HIGH                        .017                  L.0001                    .007
       AVERAGE                        .015                                            .007
      STD.DEV.                        .004                                            .001
   PERCNT:10TH
          25TH
   MEDIAN 50TH                        .015                  L.0001                    .007
          75TH
          90TH
SECONDARY CODE

                        29009L      29305L      28009L      28302L      48009L      48302L      82009L      82302L
                        COPPER      COPPER      NICKEL      NICKEL      CADMIUM     CADMIUM      LEAD        LEAD
                         TOTAL     EXTRBLE.     TOTAL      EXTRBLE.     TOTAL      EXTRBLE.     TOTAL      EXTRBLE.
                  SUBM    CU          CU          NI          NI          CD          CD          PB          PB
                   ID    MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            2(0)                    2(0)                    2(0)                                2(1)
           LOW            .033                    .015                    .004                                L.003
          HIGH            .130                    .033                    .005                                .012
       AVERAGE            .082                    .024                    .005                                .007*
      STD.DEV.            .069                    .013                    .001                                .006*
   PERCNT:10TH
          25TH
   MEDIAN 50TH            .082                    .024                    .005                                .007*
          75TH
          90TH
SECONDARY CODE
```

```
                                                      NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                        INDUSTRIAL MONITORING
STATION 20AL05EB6404    LAT. 53D 43M 26S  LONG. 113D 10M 27S   PR 3   UTM 12 356550E 5954800N  FOR JUL 27, 1983 TO JUL 17, 1984
UNION CARBIDE CANADA LTD FT SASK         COOLING WATER COMP.
SW S3 T55 R22 W4M

                          30009L      30305L      25003L      25304L      23009L      42304L      42009L      51003L
                           ZINC        ZINC      MANGANESE   MANGANESE   VANADIUM   MOLYBDENUM  MOLYBDENUM   ANTIMONY
                           TOTAL     EXTRBLE.     TOTAL      EXTRBLE.     TOTAL      EXTRBLE.     TOTAL       TOTAL

                   SUBM     ZN          ZN          MN          MN          V           MO          MO          SB
                    ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)             2(0)                    2(0)                    2(0)                    2(0)
           LOW              .188                    .059                    .014                    .012
          HIGH              .332                    .085                    .017                    .013
       AVERAGE              .260                    .072                    .016                    .013
      STD.DEV.              .102                    .018                    .002                    .001
   PERCNT:10TH
          25TH
   MEDIAN 50TH              .260                    .072                    .016                    .013
          75TH
          90TH
SECONDARY CODE

                          33005L      33104L      34005L      34102L      13111L      13306L      04102L      04304L
                          ARSENIC     ARSENIC    SELENIUM    SELENIUM    ALUMINUM    ALUMINUM   BERYLLIUM   BERYLLIUM
                          TOTAL     DISSOLVED   TOTAL       DISSOLVED   DISSOLVED   EXTRBLE.   DISSOLVED    EXTRBLE.

                   SUBM     AS          AS          SE          SE          AL          AL          BE          BE
                    ID     MG/L        MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)             2(0)                    1(1)                                2(0)                    2(2)
           LOW             .0152                  L.0002                                .489                   L.001
          HIGH             .0570                  L.0002                               1.830                   L.001
       AVERAGE             .0361                                                       1.159
      STD.DEV.             .0296                                                        .948
   PERCNT:10TH
          25TH
   MEDIAN 50TH             .0361                                                       1.159                   L.001
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE 161                     NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                    INDUSTRIAL MONITORING
STATION 20AL05EB6800    LAT. 53D 44M 34S  LONG. 113D 11M  4S   PR 3   UTM 12 355950E 5956900N  FOR APR 30, 1980 TO JUL 19, 1984
DOW CHEMICAL OF CANADA LTD FT SASK        FINAL EFFLUENT GRAB
52/11 T55 R22 W4M

                          02061F      10301L      10301F      10151L      10101L      02041L      97160S      97163S
                        TEMPERATURE     PH          PH      ALKALINITY  ALKALINITY   SPECIFIC   DISCHARGE   DISCHARGE
                        OF WATER                              PHENOL      TOTAL      CONDUCT.    INSTANT      DAILY
                                                            PHTHALEIN                                          MEAN
                  SUBM                                        CACO3       CACO3
                   ID    DEG.C      PH UNITS    PH UNITS      MG/L        MG/L        US/CM       M3/S         CFS
SAMPLES(FLAGS)           15(0)       17(0)        4(0)        16(2)       17(0)       17(0)                   14(0)
           LOW             4.0         5.3         7.3           .0        146.         981.                   .654
          HIGH            22.5         9.6         9.8         80.0        386.8       8330.                   4.01
       AVERAGE            13.3                                  6.1*       274.5       3335.                   1.5317
      STD.DEV.             5.1                                 20.0*        61.9       1911.                    .8268
   PERCNT:10TH             8.0         6.64                      .0        175.0       1360.                    .70
          25TH             9.0         6.9         7.30          .0        227.0       1730.                   1.1
   MEDIAN 50TH            13.0         7.03        8.00          .0        284.        3573.                   1.4300
          75TH            17.          7.60        9.25         L.3        313.        3970.                   1.67
          90TH            21.0         8.7                     14.2        348.        6100.                   2.05
SECONDARY CODE

                          06201L      06202L      06301L      20103L      20105L      10602L      10604L      97160S
                        BICARBONT.  BICARBONT.  CARBONATE    CALCIUM     CALCIUM    HARDNESS    HARDNESS    DISCHARGE
                         (CALCD.)    (CALCD.)    (CALCD.)   DISSOLVED   DISSOLVED     TOTAL       TOTAL      INSTANT
                                                                         (CALCD.)    (CALCD.)
                  SUBM    HCO3        HCO3        CO3          CA          CA        CACO3       CACO3
                   ID    MG/L         MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        M3/S
SAMPLES(FLAGS)            16(2)        5(0)       16(2)       14(0)        5(0)       12(0)        5(0)
           LOW             178.        271.          0.         43.0        24.6       160.9       144.
          HIGH             388.        472.         96.        190.        123.6       717.3       329.
       AVERAGE             311.*       357.          7.*        95.2        74.7       370.8       263.8
      STD.DEV.              65.*        84.         24.*        36.0        39.2       145.7        82.1
   PERCNT:10TH            Q212.                      0.         59.2                   223.2
          25TH             271.        277.          0.         77.         46.9       285.0       212.
   MEDIAN 50TH             329.        377.          0.         84.0        84.8       344.9       315.0
          75TH             366.        388.          0.        112.         93.7       440.8       319.0
          90TH             382.                     17.        126.                    491.7
SECONDARY CODE                                          11L 10L

                          11103L      12102L      19103L      09107L      17203L      16306L      26009L      26304L
                          SODIUM    MAGNESIUM   POTASSIUM    FLUORIDE    CHLORIDE    SULPHATE      IRON        IRON
                        DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED     TOTAL      EXTRBLE.

                  SUBM     NA          MG           K           F           CL         SO4          FE          FE
                   ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            17(0)       17(0)       17(0)       17(0)       17(0)       17(0)        2(0)       14(0)
           LOW            141.0        13.0         2.7         .09       151.0        50.0        1.64         .13
          HIGH           1727.         59.         18.0         .42      2432.        375.         1.67        3.42
       AVERAGE            558.3        29.0         9.11        .259      765.71      184.3        1.655       1.476
      STD.DEV.            397.6        11.1         4.13        .090      608.98       78.9         .021        .909
   PERCNT:10TH            180.0        18.3         4.8         .17       190.0        90.                      .63
          25TH            244.         23.          5.9         .19       295.        145.                      .940
   MEDIAN 50TH            590.         26.          7.8         .25       770.        180.0        1.655       1.270
          75TH            670.         33.         12.2         .31       880.        223.0                    1.89
          90TH           1088.         43.         16.0         .40      1700.        293.                     3.10
SECONDARY CODE            11L         11L         11L       06L 05L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE 162                        NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                         INDUSTRIAL MONITORING
STATION 20AL05EB6800    LAT. 53D 44M 34S  LONG. 113D 11M  4S   PR 3   UTM 12 355950E 5956900N  FOR APR 30, 1980 TO JUL 19, 1984
DOW CHEMICAL OF CANADA LTD FT SASK          FINAL EFFLUENT GRAB
S2/11 T55 R22 W4M

                         07105L       07205L       07562L       07021L       07906L       07905L       15421L       97160S
                        NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN    PHOSPHORUS   DISCHARGE
                        DISSOLVED    DISSOLVED    DISSOLVED     TOTAL      PARTICULATE  PARTICULATE    TOTAL       INSTANT
                        NO3 & NO2    NITRITE      AMMONIA      KJELDAHL      TOTAL       (CALCD.)
                  SUBM      N            N            N            N            N            N            P
                   ID     MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         M3/S
SAMPLES(FLAGS)            16(13)       16(14)       16(0)        17(0)        12(0)                     17(0)
           LOW             .004         .004         .070         1.4           .4                       .055
          HIGH            1.61          .17         8.200       14.500        4.060                     5.14
       AVERAGE             .211*        .051*       2.163        5.738        2.161                     1.936
      STD.DEV.             .466*        .034*       2.551        3.499        1.201                     1.440
   PERCNT:10TH            L.02         L.02          .150        1.70          .75                       .480
          25TH            L.050        L.050         .602        3.400        1.100                     1.050
    MEDIAN 50TH           L.050        L.050        1.330        4.500        2.080                     2.000
          75TH            L.050        L.050        2.450        7.750        3.320                     2.300
          90TH            1.16         L.050        8.000       10.000        3.560                     5.000
SECONDARY CODE           10L          06L          61L          15L                                  19L 06L

                         10474L       10407L       10511L       10453L       14101L       97160S       97163S
                         RESIDUE      RESIDUE      RESIDUE      RESIDUE      SILICA      DISCHARGE    DISCHARGE
                          TOTAL     NONFILTRABLE   VOLATILE    FILTRABLE    REACTIVE      INSTANT       DAILY
                                                  NONFILTR.                                              MEAN
                  SUBM                            (CALCD.)                    SIO2
                   ID    MG/L          MG/L         MG/L         MG/L         MG/L         M3/S          CFS
SAMPLES(FLAGS)            16(0)        17(0)        1(0)         13(0)        17(0)                     14(0)
           LOW            972.0         7.          37.0        1080.          4.2                       .654
          HIGH            5587.        219.          37.0        3570.         15.3                     4.01
       AVERAGE            2264.6        78.3                     2106.9         7.56                    1.5317
      STD.DEV.            1189.7        58.6                      773.9         2.64                     .8268
   PERCNT:10TH            1125.0        30.                      1140.          5.0                      .70
          25TH            1387.5        45.0                     1540.          6.0                     1.1
    MEDIAN 50TH           2049.5        63.                      2110.          7.3                     1.4300
          75TH            2729.5        90.                      2400.          8.5                     1.67
          90TH            3646.        218.0                     3320.         10.0                     2.05
SECONDARY CODE           71L          01L                       51L          02L

                         00205L       02074L       06537L       06524L       02001L       16101L       10701L       06608L
                          TOTAL      TURBIDITY     PHENOLIC    OIL AND       ODOUR       SULPHIDE     SURFACT.      CYANIDE
                        DISSOLVED                  MATERIAL    GREASE      THRESHOLD    DISSOLVED     N-ALKYL
                         SOLIDS                                              NUMBER                   SULPHNTS.
                  SUBM                             PHENOL                                  S            LAS           C
                   ID     MG/L         NTU         MG/L         MG/L          TON         MG/L         MG/L         M
SAMPLES(FLAGS)            16(0)        14(0)       17(0)        17(0)        12(0)        1(0)         13(2)           ))
           LOW             594.          1.0        .025          0.            1.         .35         L.02            73
          HIGH            4664.         37.0        .145          6.0       10000.         .35         5.15          .0090
       AVERAGE            1815.8        18.8        .060          1.712      1768.                     2.283*        .0067
      STD.DEV.            1071.6        11.8        .042          1.311      3856.                     1.960*        .0026
   PERCNT:10TH             786.          3.5        .026           .500         1.                     L.02
          25TH             999.5        10.0        .029          1.1           1.                      .34          .004
    MEDIAN 50TH           1599.6        16.0        .044          1.3           4.                     2.00          .0075
          75TH            1978.5        30.0        .070          2.0         550.                     4.1           .009
          90TH            3301.         35.0        .145          2.700     10000.                     4.77
SECONDARY CODE                         73L                      21L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE 163                     NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                    INDUSTRIAL MONITORING
STATION 20AL05EB6800    LAT. 53D 44M 34S  LONG. 113D 11M  4S   PR 3   UTM 12 355950E 5956900N  FOR APR 30, 1980 TO JUL 19, 1984
DOW CHEMICAL OF CANADA LTD FT SASK        FINAL EFFLUENT GRAB
S2/11 T55 R22 W4M

                       08304L        08202L        06107L        06154L        06001L        06051L        06006L        06905L
                       OXYGEN        OXYGEN        CARBON        CARBON        CARBON        CARBON        CARBON        CARBON
                        TOTAL       BIOCHEM.      DISSOLVED     DISSOLVED       TOTAL         TOTAL       TOTAL        PARTICULATE
                         COD       DEMAND-BOD      ORGANIC      INORGANIC      ORGANIC      INORGANIC                     TOTAL
               SUBM    02              02         C             C             C             C             C             C
                ID     MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)          17(0)         14(0)         12(0)         12(0)          4(0)          1(0)          1(0)         12(0)
           LOW          80.           35.0          21.           31.0          21.           55.           76.            3.74
          HIGH          989.7         380.0         314.0         82.           138.0         55.           76.           33.82
       AVERAGE          367.4         147.74        120.62        60.48         67.82                                     14.09
      STD.DEV.          209.7         114.98         84.68        18.16         49.63                                      7.91
   PERCNT:10TH          107.0          40.0          50.          37.0                                                     8.40
          25TH          238.8          56.4          58.95        44.50         38.50                                      9.64
   MEDIAN 50TH          343.0         107.00         95.95        63.85         56.15                                     11.86
          75TH          444.0         177.5         151.00        76.55         97.15                                     17.03
          90TH          521.0         370.0         233.20        80.                                                      22.86
SECONDARY CODE         01L                                                 07L 05L

                       24101L        24009L        24302L        80015L        80011L        27009L        27302L        47304L
                      CHROMIUM      CHROMIUM      CHROMIUM      MERCURY       MERCURY        COBALT        COBALT        SILVER
                     HEXAVALENT       TOTAL        EXTRBLE.      TOTAL         TOTAL         TOTAL        EXTRBLE.      EXTRBLE.

               SUBM      CR            CR            CR            HG            HG            CO            CO            AG
                ID     MG/L          MG/L          MG/L          MG/L          UG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)          13(10)        15(0)          1(0)         15(11)                      15(7)          2(2)          2(2)
           LOW          L.001         .005           .01          L.0001                       L.001         L.001         L.02
          HIGH           .02          .034           .01           .0006                       L.01          L.001         L.02
       AVERAGE           .003*        .013                         .0001*                      .003*
      STD.DEV.           .006*        .008                         .0001*                      .003*
   PERCNT:10TH          L.001         .007                        L.0001                       L.001
          25TH          L.001         .007                        L.0001                       L.001
   MEDIAN 50TH          L.001         .011                        L.0001                       .003          L.001         L.020
          75TH          L.001         .016                         .0001                       .004
          90TH           .01          .03                          .0001                       L.01
SECONDARY CODE
                       29009L        29305L        28009L        28302L        48009L        48302L        82009L        82302L
                       COPPER        COPPER        NICKEL        NICKEL        CADMIUM       CADMIUM        LEAD          LEAD
                        TOTAL        EXTRBLE.       TOTAL        EXTRBLE.       TOTAL        EXTRBLE.      TOTAL         EXTRBLE.

               SUBM      CU            CU            NI            NI            CD            CD            PB            PB
                ID     MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)          15(0)          2(0)         15(2)          2(0)         15(10)         2(2)          7(5)         10(7)
           LOW           .007          .001          .019          .006         L.001         L.001         L.003         L.002
          HIGH           .085          .012          .043          .016          .013         L.001          .004         L.02
       AVERAGE           .029          .007          .029*         .011          .003*                       .003*         .007*
      STD.DEV.           .022          .008          .008*         .007          .004*                       .000*         .007*
   PERCNT:10TH           .011                       L.02                        L.001                                     L.002
          25TH           .012                        .021                       L.001                       L.003         L.003
   MEDIAN 50TH           .020          .007          .026          .011         L.001         L.001         L.003          .003*
          75TH           .032                        .037                        .004                        .004          .006
          90TH           .062                        .039                       L.01                                      L.020
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0010 -  0012 PAGE 164                       NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                      INDUSTRIAL MONITORING
STATION 20AL05EB6800    LAT. 53D 44M 34S  LONG. 113D 11M  4S   PR 3   UTM 12 355950E 5956900N  FOR APR 30, 1980 TO JUL 19, 1984
DOW CHEMICAL OF CANADA LTD FT SASK         FINAL EFFLUENT GRAB
S2/11 T55 R22 W4M

                         30009L      30305L      25003L      25304L      23009L      42304L      42009L      51003L
                          ZINC        ZINC     MANGANESE   MANGANESE   VANADIUM   MOLYBDENUM  MOLYBDENUM   ANTIMONY
                          TOTAL     EXTRBLE.     TOTAL     EXTRBLE.     TOTAL     EXTRBLE.     TOTAL       TOTAL

                  SUBM     ZN          ZN          MN          MN          V           MO          MO          SB
                   ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           15(0)        2(0)       15(0)        2(0)       14(0)                   12(6)        2(1)
           LOW            .014        .040        .011        .13         .005                   L.001       L.001
          HIGH           1.86         .710        .229        .380        .07                     .216        .002
       AVERAGE            .425        .375        .147        .255        .030                    .044*       .0015*
      STD.DEV.            .537        .474        .060        .177        .020                    .072*       .0007*
   PERCNT:10TH            .046                    .053                    .008                   L.001
          25TH            .093                    .114                    .013                   L.001
   MEDIAN 50TH            .213        .375        .149        .255        .024                    .007        .0015*
          75TH            .486                    .192                    .047                    .063*
          90TH           1.48                     .223                    .05                     .149
SECONDARY CODE                                                          02L

                         33005L      33104L      34005L      34102L      13111L      13306L      04102L      04304L
                         ARSENIC     ARSENIC    SELENIUM    SELENIUM    ALUMINUM    ALUMINUM   BERYLLIUM   BERYLLIUM
                          TOTAL    DISSOLVED     TOTAL     DISSOLVED   DISSOLVED    EXTRBLE.   DISSOLVED    EXTRBLE.

                  SUBM     AS          AS          SE          SE          AL          AL          BE          BE
                   ID     MG/L        MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            8(0)        2(0)        7(4)        2(2)        2(0)       11(0)        2(2)       12(11)
           LOW            .0090       .0017      L.0002      L.0002      1570.         .130      L.005       L.001
          HIGH            .024        .0057       .011       L.0002      1570.        1.210      L.005        .004
       AVERAGE            .0150       .0037       .0020*                 1570.00       .617                   .001*
      STD.DEV.            .0051       .0028       .0040*                     .00       .313                   .001*
   PERCNT:10TH                                                                         .269                  L.001
          25TH            .0107                  L.0002                                .363                  L.001
   MEDIAN 50TH            .0150       .0037      L.0002      L.0002      1570.00       .655      L.005       L.001
          75TH            .0178                   .002                                 .747                  L.001
          90TH                                                                         .926                  L.001
SECONDARY CODE                                   07L                                  02L                    02L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE 165                      NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                      INDUSTRIAL MONITORING
STATION 20AL05EB6801    LAT. 53D 44M 34S  LONG. 113D 11M  4S   PR 3   UTM 12 355950E 5956900N  FOR MAR 25, 1981 TO JUL 19, 1984
DOW CHEMICAL OF CANADA LTD FT SASK         FINAL EFFLUENT COMP.
S2/11 T55 R22 W4M

                         02061F        10301L        10301F        10151L        10101L        02041L        97160S        97163S
                      TEMPERATURE        PH            PH        ALKALINITY    ALKALINITY     SPECIFIC     DISCHARGE     DISCHARGE
                      OF WATER                                     PHENOL         TOTAL       CONDUCT.      INSTANT        DAILY
                                                                 PHTHALEIN                                                 MEAN
               SUBM                                                CACO3         CACO3
                 ID      DEG.C        PH UNITS      PH UNITS       MG/L          MG/L          US/CM          M3/S          CFS
SAMPLES(FLAGS)                          5(0)          1(0)         5(1)          5(0)          5(0)                        4(0)
           LOW                          6.56          7.8            .0         152.0         1400.                        1.1
          HIGH                          9.3           7.8          40.8         393.0         5730.                        4.01
       AVERAGE                                                      8.2*        287.0         2741.                        2.0825
      STD.DEV.                                                     18.2*         86.4         1742.                        1.3082
  PERCNT:10TH
          25TH                          6.9                          .0         290.          1620.                        1.3250
   MEDIAN 50TH                          7.40                         .0         296.0         2420.                        1.6100
          75TH                          7.6                         L.1         304.          2534.                        2.8400
          90TH
SECONDARY CODE

                         06201L        06202L        06301L        20103L        20105L        10602L        10604L        97160S
                       BICARBONT.    BICARBONT.    CARBONATE      CALCIUM       CALCIUM      HARDNESS      HARDNESS     DISCHARGE
                        (CALCD.)      (CALCD.)      (CALCD.)     DISSOLVED     DISSOLVED       TOTAL         TOTAL        INSTANT
                                                                               (CALCD.)      (CALCD.)
               SUBM     HCO3           HCO3          CO3            CA            CA          CACO3         CACO3
                 ID   MG/L             MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          M3/S
SAMPLES(FLAGS)           5(1)          2(0)          5(1)          4(0)          2(0)          3(0)          2(0)
           LOW           Q185.          186.            0.          71.0          45.4         262.5         200.
          HIGH            479.          479.           49.         124.0         123.6         478.4         289.0
       AVERAGE            330.*         332.           10.*         88.5          84.5         344.3         244.5
      STD.DEV.            114.*         208.           22.*         24.0          55.3         117.1          62.9
  PERCNT:10TH
          25TH            254.                          0.          75.0
   MEDIAN 50TH            361.          332.            0.          79.5          84.5         292.0         244.5
          75TH            371.                         Q0.         102.0
          90TH
SECONDARY CODE                                                  11L 10L

                         11103L        12102L        19103L        09107L        17203L        16306L        26009L        26304L
                         SODIUM       MAGNESIUM     POTASSIUM     FLUORIDE      CHLORIDE      SULPHATE       IRON          IRON
                       DISSOLVED     DISSOLVED     DISSOLVED     DISSOLVED     DISSOLVED     DISSOLVED      TOTAL        EXTRBLE.

               SUBM       NA            MG            K             F             CL           504           FE            FE
                 ID      MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)           5(0)          5(0)          5(0)          5(0)          5(0)          5(0)          1(0)          3(0)
           LOW          190.0          20.7          5.00           .19         144.0           95.          1.47          .840
          HIGH          1022.          41.0          19.0          .330         1304.          220.          1.47          1.19
       AVERAGE          448.6          25.3         10.34          .256        564.60         162.2                       1.053
      STD.DEV.          338.1           8.8          5.67          .059        460.71          52.6                        .187
  PERCNT:10TH
          25TH          221.           21.0          7.10           .20         260.          129.0
   MEDIAN 50TH          350.0          21.           7.6            .28        430.00         159.0                       1.13
          75TH          460.0          23.          13.0            .28        685.00         208.0
          90TH
SECONDARY CODE          11L           11L           11L         06L 05L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE 166                  NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                 INDUSTRIAL MONITORING
STATION 20AL05EB6801    LAT. 53D 44M 34S  LONG. 113D 11M  4S   PR 3   UTM 12 355950E 5956900N  FOR MAR 25, 1981 TO JUL 19, 1984
DOW CHEMICAL OF CANADA LTD FT SASK        FINAL EFFLUENT COMP.
S2/11 T55 R22 W4M

                        07105L       07205L       07562L       07021L       07906L       07905L       15421L       97160S
                       NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN    PHOSPHORUS   DISCHARGE
                       DISSOLVED    DISSOLVED    DISSOLVED     TOTAL     PARTICULATE  PARTICULATE    TOTAL       INSTANT
                       NO3 & NO2    NITRITE      AMMONIA      KJELDAHL      TOTAL       (CALCD.)
                SUBM       N            N            N            N            N            N            P
                 ID      MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         M3/S
SAMPLES(FLAGS)           5(4)         5(4)         4(0)         5(0)         3(0)                      5(0)
           LOW           .006         .006          .09         2.40          1.5                      .415
          HIGH          L.050        L.050        1.590       11.000        5.660                      3.04
       AVERAGE          .035*        .035*         .570        5.350        3.070                     1.491
      STD.DEV.          .021*        .021*         .692        3.561        2.260                     1.042
   PERCNT:10TH
          25TH          L.02         L.02          .145         2.6                                    .650
   MEDIAN 50TH          L.05         L.05          .300        4.250         2.05                     1.600
          75TH          L.05         L.05          .995        6.500                                   1.750
          90TH
SECONDARY CODE       10L          06L          61L          15L                                    19L 06L

                        10474L       10407L       10511L       10453L       14101L       97160S       97163S
                        RESIDUE      RESIDUE      RESIDUE      RESIDUE      SILICA      DISCHARGE    DISCHARGE
                         TOTAL    NONFILTRABLE   VOLATILE    FILTRABLE    REACTIVE      INSTANT       DAILY
                                                NONFILTR.                                              MEAN
                SUBM                            (CALCD.)                    SIO2
                 ID      MG/L         MG/L         MG/L         MG/L         MG/L         M3/S          CFS
SAMPLES(FLAGS)           4(0)         4(0)                      4(0)         5(0)                      4(0)
           LOW          996.0          80.                     1050.         5.70                      1.1
          HIGH          2978.         108.                     2870.         7.80                      4.01
       AVERAGE         1709.3         93.8                    1762.5         6.70                     2.0825
      STD.DEV.          904.5         13.8                     779.0          .84                     1.3082
   PERCNT:10TH
          25TH         1063.0         82.0                    1275.0          6.3                     1.3250
   MEDIAN 50TH         1431.5         93.5                    1565.0          6.4                     1.6100
          75TH         2355.5        105.5                    2250.0          7.3                     2.8400
          90TH
SECONDARY CODE       71L          01L                       51L          02L

                        00205L       02074L       06537L       06524L       02001L       16101L       10701L       06608L
                        TOTAL      TURBIDITY     PHENOLIC     OIL AND       ODOUR       SULPHIDE     SURFACT.      CYANIDE
                       DISSOLVED                 MATERIAL     GREASE      THRESHOLD    DISSOLVED     N-ALKYL
                        SOLIDS                                              NUMBER                  SULPHNTS.
                SUBM                              PHENOL                                    S          LAS          CN
                 ID      MG/L         NTU          MG/L         MG/L         TON          MG/L         MG/L         MG/L
SAMPLES(FLAGS)           4(0)         4(0)         5(0)         5(1)         3(0)                      3(0)
           LOW           874.         18.0         .018         L1.0           1.                      .05
          HIGH          2795.         62.0         .130          4.3       10000.                      5.97
       AVERAGE         1507.3         32.0         .047        2.100*       3335.                     2.607
      STD.DEV.          888.2         20.2         .047        1.405*       5772.                     3.041
   PERCNT:10TH
          25TH          919.0         20.5         .020        1.100
   MEDIAN 50TH         1180.0         24.0         .034          1.4           4.                      1.80
          75TH         2095.5         43.5         .034          2.7
          90TH
SECONDARY CODE                                              21L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE 167                         NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                        INDUSTRIAL MONITORING
STATION 20AL05EB6801    LAT. 53D 44M 34S  LONG. 113D 11M  4S   PR 3   UTM 12 355950E 5956900N  FOR MAR 25, 1981 TO JUL 19, 1984
DOW CHEMICAL OF CANADA LTD FT SASK          FINAL EFFLUENT COMP.
S2/11 T55 R22 W4M

                          08304L        08202L        06107L        06154L        06001L        06051L        06006L        06905L
                          OXYGEN        OXYGEN        CARBON        CARBON        CARBON        CARBON        CARBON        CARBON
                           TOTAL       BIOCHEM.      DISSOLVED     DISSOLVED       TOTAL         TOTAL        TOTAL       PARTICULATE
                            COD       DEMAND-BOD      ORGANIC      INORGANIC      ORGANIC      INORGANIC                    TOTAL
                    SUBM    02            02            C             C             C             C             C             C
                     ID    MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)              5(0)          3(0)          3(0)          3(0)          2(0)          1(0)                        3(0)
           LOW              100.          48.7          40.           48.           67.5          28.0                        11.86
          HIGH              437.1         229.0         233.20        72.           109.0         28.0                        27.41
       AVERAGE              302.1         148.40        141.07        61.67         88.25                                     20.76
      STD.DEV.              153.0          91.65         96.91        12.34         29.34                                      8.01
  PERCNT:10TH
          25TH              184.3
   MEDIAN 50TH              352.0         167.5         150.          65.00         88.25                                     23.
          75TH              437.0
          90TH
SECONDARY CODE            01L                                                   07L 05L        52L

                          24101L        24009L        24302L        80015L        80011L        27009L        27302L        47304L
                         CHROMIUM      CHROMIUM      CHROMIUM      MERCURY       MERCURY       COBALT        COBALT        SILVER
                        HEXAVALENT      TOTAL        EXTRBLE.       TOTAL         TOTAL         TOTAL        EXTRBLE.      EXTRBLE.

                    SUBM   CR            CR            CR            HG            HG            CO            CO            AG
                     ID    MG/L          MG/L          MG/L          MG/L          UG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)             3(2)          3(0)          1(1)          3(2)                        3(2)          1(1)          1(1)
           LOW             L.001         .008          L.01          L.0001                      L.001         L.001         L.02
          HIGH              .02          .03           L.01           .0001                      L.01          L.001         L.02
       AVERAGE              .007*        .017                         .0001*                      .005*
      STD.DEV.              .011*        .011                         .0000*                      .005*
  PERCNT:10TH
          25TH
   MEDIAN 50TH             L.001         .014                        L.0001                       .005
          75TH
          90TH
SECONDARY CODE

                          29009L        29305L        28009L        28302L        48009L        48302L        82009L        82302L
                          COPPER        COPPER        NICKEL        NICKEL        CADMIUM       CADMIUM       LEAD          LEAD
                          TOTAL        EXTRBLE.       TOTAL        EXTRBLE.       TOTAL        EXTRBLE.       TOTAL        EXTRBLE.

                    SUBM   CU            CU            NI            NI            CD            CD            PB            PB
                     ID    MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)             3(0)          1(0)          3(1)          1(0)          3(2)          1(1)          1(0)          3(3)
           LOW              .022          .085         L.02           .020         L.001         L.001          .004         L.002
          HIGH              .056          .085          .029          .020         L.01          L.001          .004         L.02
       AVERAGE              .040                        .023*                       .004*
      STD.DEV.              .017                        .005*                       .005*
  PERCNT:10TH
          25TH
   MEDIAN 50TH              .043                        .020                        .002                                     L.003
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0010 -  0012 PAGE 168                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB6801    LAT. 53D 44M 34S  LONG. 113D 11M  4S   PR 3   UTM 12 355950E 5956900N  FOR MAR 25, 1981 TO JUL 19, 1984
DOW CHEMICAL OF CANADA LTD FT SASK        FINAL EFFLUENT COMP.
S2/11 T55 R22 W4M

                        30009L        30305L        25003L        25304L        23009L        42304L        42009L        51003L
                         ZINC          ZINC       MANGANESE     MANGANESE     VANADIUM     MOLYBDENUM    MOLYBDENUM    ANTIMONY
                        TOTAL        EXTRBLE.       TOTAL       EXTRBLE.       TOTAL        EXTRBLE.       TOTAL         TOTAL

                  SUBM    ZN            ZN            MN            MN            V             MO            MO            SB
                   ID    MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)           3(0)          1(0)          3(0)          1(0)          3(0)                        2(1)          1(1)
           LOW           .148          .170          .137          .15           .004                        L.02          L.001
          HIGH           1.69          .170          .222          .15           .06                         .149          L.001
       AVERAGE           .689                        .179                        .024                        .084*
      STD.DEV.           .868                        .043                        .031                        .091*
   PERCNT:10TH
          25TH
   MEDIAN 50TH           .229                        .177                        .008                        .084*
          75TH
          90TH
SECONDARY CODE                                                             02L

                        33005L        33104L        34005L        34102L        13111L        13306L        04102L        04304L
                        ARSENIC       ARSENIC      SELENIUM      SELENIUM      ALUMINUM      ALUMINUM     BERYLLIUM     BERYLLIUM
                        TOTAL        DISSOLVED     TOTAL         DISSOLVED     DISSOLVED     EXTRBLE.     DISSOLVED      EXTRBLE.

                  SUBM    AS            AS            SE            SE            AL            AL            BE            BE
                   ID    MG/L          MG/L          MG/L          MG/L          UG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)           2(0)          1(0)          1(0)          1(1)          1(0)          1(0)          1(1)          2(2)
           LOW           .0125         .0048         .006          L.0002        1490.         2.40          L.005         L.001
          HIGH           .018          .0048         .006          L.0002        1490.         2.40          L.005         L.001
       AVERAGE           .0153
      STD.DEV.           .0039
   PERCNT:10TH
          25TH
   MEDIAN 50TH           .0153                                                                                            L.001
          75TH
          90TH
SECONDARY CODE                              07L                                        02L                         02L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE 169                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB6803    LAT. 53D 44M 34S  LONG. 113D 11M  4S   PR 3  UTM 12 355950E 5956900N  FOR JUL 06, 1983 TO JUL 19, 1984
DOW CHEMICAL OF CANADA LTD FT SASK          STORM WATER POND GRAB
S2/11 T55 R22 W4M

                        02061F      10301L      10301F      10151L      10101L      02041L      97160S      97163S
                        TEMPERATURE PH          PH          ALKALINITY  ALKALINITY  SPECIFIC    DISCHARGE   DISCHARGE
                        OF WATER                            PHENOL      TOTAL       CONDUCT.    INSTANT     DAILY
                                                            PHTHALEIN                                       MEAN
                   SUBM                                     CACO3       CACO3
                   ID   DEG.C       PH UNITS    PH UNITS    MG/L        MG/L        US/CM       M3/S        CFS
    SAMPLES(FLAGS)      1(0)        2(0)                    1(0)        2(0)        2(0)
               LOW      21.0        9.7                     250.0       239.        5909.
              HIGH      21.0        10.02                   250.0       663.0       7440.
           AVERAGE                                                      451.0       6675.
          STD.DEV.                                                      299.8       1083.
       PERCNT:10TH
              25TH
       MEDIAN 50TH                  9.86                                451.0       6675.
              75TH
              90TH
    SECONDARY CODE

                        06201L      06202L      06301L      20103L      20105L      10602L      10604L      97160S
                        BICARBONT.  BICARBONT.  CARBONATE   CALCIUM     CALCIUM     HARDNESS    HARDNESS    DISCHARGE
                        (CALCD.)    (CALCD.)    (CALCD.)    DISSOLVED   DISSOLVED   TOTAL       TOTAL       INSTANT
                                                                        (CALCD.)    (CALCD.)
                   SUBM HCO3        HCO3        CO3         CA          CA          CACO3       CACO3
                   ID   MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        M3/S
    SAMPLES(FLAGS)      1(0)        1(0)        1(0)        2(0)        1(0)        2(0)
               LOW      199.        127.        300.        8.4         34.8        34.1
              HIGH      199.        127.        300.        35.         34.8        120.3
           AVERAGE                                          21.7                    77.2
          STD.DEV.                                          18.8                    60.9
       PERCNT:10TH
              25TH
       MEDIAN 50TH                                          21.7                    77.2
              75TH
              90TH
    SECONDARY CODE                                          10L

                        11103L      12102L      19103L      09107L      17203L      16306L      26009L      26304L
                        SODIUM      MAGNESIUM   POTASSIUM   FLUORIDE    CHLORIDE    SULPHATE    IRON        IRON
                        DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED   TOTAL       EXTRBLE.

                   SUBM NA          MG          K           F           CL          SO4         FE          FE
                   ID   MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
    SAMPLES(FLAGS)      2(0)        2(0)        2(0)        2(0)        2(0)        2(0)                    1(0)
               LOW      1400.0      3.2         7.90        .26         1450.0      94.0                    .70
              HIGH      1610.       8.          13.0        2.00        2275.       194.                    .70
           AVERAGE      1505.0      5.6         10.45       1.130       1862.50     144.0
          STD.DEV.      148.5       3.4         3.61        1.230       583.36      70.7
       PERCNT:10TH
              25TH
       MEDIAN 50TH      1505.0      5.6         10.45       1.130       1862.50     144.0
              75TH
              90TH
    SECONDARY CODE                                          05L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE 170                          NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                         INDUSTRIAL MONITORING
STATION 20AL05EB6803    LAT. 53D 44M 34S  LONG. 113D 11M  4S   PR 3   UTM 12 355950E 5956900N  FOR JUL 06, 1983 TO JUL 19, 1984
DOW CHEMICAL OF CANADA LTD FT SASK        STORM WATER POND GRAB
S2/11 T55 R22 W4M

                           07105L        07205L       07562L       07021L       07906L        07905L       15421L       97160S
                          NITROGEN      NITROGEN     NITROGEN     NITROGEN     NITROGEN      NITROGEN    PHOSPHORUS    DISCHARGE
                          DISSOLVED     DISSOLVED    DISSOLVED      TOTAL     PARTICULATE   PARTICULATE    TOTAL        INSTANT
                          NO3 & NO2      NITRITE     AMMONIA      KJELDAHL      TOTAL        (CALCD.)
                 SUBM         N             N            N            N            N             N            P
                  ID        MG/L          MG/L         MG/L         MG/L         MG/L          MG/L         MG/L          M3/S
SAMPLES(FLAGS)              2(0)          2(1)         1(0)         2(0)         1(0)                       2(0)
           LOW               .09          L.05          .980        1.65          .14                        .275
          HIGH               .620          .130         .980        2.050         .14                        .280
       AVERAGE               .355          .090*                    1.850                                    .278
      STD.DEV.               .375          .057*                     .283                                    .004
  PERCNT:10TH
          25TH
   MEDIAN 50TH               .355          .090*                    1.850                                    .278
          75TH
          90TH
SECONDARY CODE            10L          06L                        15L                                     06L

                           10474L        10407L       10511L       10453L       14101L        97160S       97163S
                          RESIDUE       RESIDUE      RESIDUE      RESIDUE       SILICA      DISCHARGE    DISCHARGE
                           TOTAL     NONFILTRABLE    VOLATILE    FILTRABLE     REACTIVE       INSTANT       DAILY
                                                    NONFILTR.                                               MEAN
                 SUBM                               (CALCD.)                     SIO2
                  ID       MG/L          MG/L         MG/L         MG/L          MG/L          M3/S          CFS
SAMPLES(FLAGS)              2(0)          2(0)                      2(0)         2(0)
           LOW             3600.0         11.0                     3600.0         3.7
          HIGH             4449.          49.                      4400.          8.50
       AVERAGE             4024.5         30.0                     4000.0         6.10
      STD.DEV.              600.3         26.9                      565.7         3.39
  PERCNT:10TH
          25TH
   MEDIAN 50TH             4024.5         30.0                     4000.0         6.10
          75TH
          90TH
SECONDARY CODE            71L          01L                        51L          02L

                           00205L        02074L       06537L       06524L       02001L        16101L       10701L       06608L
                           TOTAL       TURBIDITY     PHENOLIC     OIL AND       ODOUR        SULPHIDE     SURFACT.      CYANIDE
                          DISSOLVED                  MATERIAL     GREASE      THRESHOLD     DISSOLVED     N-ALKYL
                           SOLIDS                                               NUMBER                   SULPHNTS.
                 SUBM                                 PHENOL                                    S           LAS          CN
                  ID        MG/L          NTU         MG/L         MG/L          TON          MG/L         MG/L         MG/L
SAMPLES(FLAGS)              1(0)          2(0)         2(0)         2(0)         1(0)          1(1)         1(0)
           LOW             4278.          20.0          .019          .6           8.          L.01         1.00
          HIGH             4278.          25.0          .040         1.4           8.          L.01         1.00
       AVERAGE                            22.5          .030        1.000
      STD.DEV.                             3.5          .015         .566
  PERCNT:10TH
          25TH
   MEDIAN 50TH                            22.5          .030        1.000
          75TH
          90TH
SECONDARY CODE                                                    21L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE 171                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB6803    LAT. 53D 44M 34S  LONG. 113D 11M  4S   PR 3   UTM 12 355950E 5956900N  FOR JUL 06, 1983 TO JUL 19, 1984
DOW CHEMICAL OF CANADA LTD FT SASK         STORM WATER POND GRAB
S2/11 T55 R22 W4M
                      08304L       08202L       06107L       06154L       06001L       06051L       06006L       06905L
                      OXYGEN       OXYGEN       CARBON       CARBON       CARBON       CARBON       CARBON       CARBON
                       TOTAL      BIOCHEM.     DISSOLVED    DISSOLVED      TOTAL        TOTAL      TOTAL      PARTICULATE
                         COD     DEMAND-BOD     ORGANIC     INORGANIC     ORGANIC     INORGANIC                  TOTAL
                 SUBM    O2           O2           C            C            C            C            C            C
                  ID   MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)          2(0)         1(0)         1(0)         1(0)         1(0)                                   1(0)
           LOW          75.1        107.0         65.9         41.4         12.8                                   1.56
          HIGH         280.         107.0         65.9         41.4         12.8                                   1.56
       AVERAGE         177.5
      STD.DEV.         144.9
  PERCNT:10TH
          25TH
   MEDIAN 50TH         177.5
          75TH
          90TH
SECONDARY CODE        01L                                    05L
                      24101L       24009L       24302L       80015L       80011L       27009L       27302L       47304L
                     CHROMIUM     CHROMIUM     CHROMIUM      MERCURY      MERCURY      COBALT       COBALT       SILVER
                    HEXAVALENT     TOTAL       EXTRBLE.      TOTAL        TOTAL        TOTAL       EXTRBLE.     EXTRBLE.

                 SUBM    CR           CR           CR           HG           HG           CO           CO           AG
                  ID   MG/L         MG/L         MG/L         MG/L         UG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)          1(0)         1(0)         1(0)         2(1)                      1(0)         1(1)
           LOW          .127         .015         .06        L.0001                      .003        L.001
          HIGH          .127         .015         .06         .0001                      .003        L.001
       AVERAGE                                                .0001*
      STD.DEV.                                                .0000*
  PERCNT:10TH
          25TH
   MEDIAN 50TH                                                .0001*
          75TH
          90TH
SECONDARY CODE
                      29009L       29305L       28009L       28302L       48009L       48302L       82009L       82302L
                      COPPER       COPPER       NICKEL       NICKEL      CADMIUM      CADMIUM        LEAD         LEAD
                      TOTAL       EXTRBLE.      TOTAL       EXTRBLE.      TOTAL       EXTRBLE.      TOTAL       EXTRBLE.

                 SUBM    CU           CU           NI           NI           CD           CD           PB           PB
                  ID   MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)          1(0)         1(0)         1(0)         1(0)         1(1)         1(1)                      2(2)
           LOW          .009         .020         .006         .019        L.001        L.001                      L.002
          HIGH          .009         .020         .006         .019        L.001        L.001                      L.003
       AVERAGE
      STD.DEV.
  PERCNT:10TH
          25TH
   MEDIAN 50TH                                                                                                     L.002
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0010 -  0012 PAGE 172                          NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                        INDUSTRIAL MONITORING
STATION 20AL05EB6803    LAT. 53D 44M 34S  LONG. 113D 11M  4S   PR 3   UTM 12 355950E 5956900N  FOR JUL 06, 1983 TO JUL 19, 1984
DOW CHEMICAL OF CANADA LTD FT SASK         STORM WATER POND GRAB
S2/11 T55 R22 W4M

                         30009L      30305L      25003L      25304L      23009L      42304L      42009L      51003L
                          ZINC        ZINC      MANGANESE   MANGANESE    VANADIUM   MOLYBDENUM  MOLYBDENUM   ANTIMONY
                         TOTAL      EXTRBLE.      TOTAL      EXTRBLE.     TOTAL      EXTRBLE.     TOTAL       TOTAL

                   SUBM   ZN          ZN          MN          MN          V           MO          MO          SB
                    ID   MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            1(0)        1(0)        1(0)        1(0)        2(0)                    1(0)
           LOW             .007        .005        .014        .05         .006                    .007
          HIGH             .007        .005        .014        .05         .011                    .007
       AVERAGE                                                             .009
      STD.DEV.                                                             .004
   PERCNT:10TH
          25TH
   MEDIAN 50TH                                                             .009
          75TH
          90TH
SECONDARY CODE                                                         02L

                         33005L      33104L      34005L      34102L      13111L      13306L      04102L      04304L
                         ARSENIC     ARSENIC     SELENIUM    SELENIUM    ALUMINUM    ALUMINUM    BERYLLIUM   BERYLLIUM
                         TOTAL      DISSOLVED   TOTAL       DISSOLVED   DISSOLVED    EXTRBLE.    DISSOLVED    EXTRBLE.

                   SUBM   AS          AS          SE          SE          AL          AL          BE          BE
                    ID   MG/L        MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           1(0)        1(0)                    1(0)                    2(0)                    2(2)
           LOW           .0119       .0077                   .0002                   .12                     L.001
          HIGH           .0119       .0077                   .0002                   .301                    L.001
       AVERAGE                                                                       .211
      STD.DEV.                                                                       .128
   PERCNT:10TH
          25TH
   MEDIAN 50TH                                                                       .211                    L.001
          75TH
          90TH
SECONDARY CODE                                                                   02L                     02L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE 173                  NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                 INDUSTRIAL MONITORING
STATION 20AL05EB7800    LAT. 53D 46M 30S  LONG. 113D  4M 45S   PR 3   UTM 12 363000E 5960250N  FOR MAR 11, 1980 TO APR 18, 1984
DIAMOND SHAMROCK ALTA GAS LTD FT SASK.    FINAL EFFLUENT GRAB
SE S29 T55 R21 W4M

                       02061F      10301L     10301F      10151L      10101L      02041L      97160S      97163S
                     TEMPERATURE     PH         PH      ALKALINITY  ALKALINITY   SPECIFIC   DISCHARGE   DISCHARGE
                      OF WATER                            PHENOL       TOTAL     CONDUCT.    INSTANT      DAILY
                                                        PHTHALEIN                                         MEAN
                SUBM                                      CACO3       CACO3
                 ID    DEG.C      PH UNITS   PH UNITS     MG/L        MG/L        US/CM        M3/S        CFS
SAMPLES(FLAGS)          9(0)       14(0)       2(0)       12(2)       12(0)       12(0)                   10(0)
           LOW          16.0        6.48       8.9          .0         88.0        588.                    .13
          HIGH          40.0        9.09       8.9        29.2        327.0       2390.                    .46
       AVERAGE          25.8                               2.5*       202.5       1631.                    .2511
      STD.DEV.           7.7                               8.4*        70.9        579.                    .1044
  PERCNT:10TH                       6.68                    .0        117.         718.                    .1350
          25TH          21.5        7.40                    .0        145.5       1288.                    .15
   MEDIAN 50TH          24.0        7.85       8.90         .0        208.5       1730.                    .2550
          75TH          30.0        8.3                     .0*       254.5       2100.                    .294
          90TH                      9.0                    L.5        278.        2270.                    .4050
SECONDARY CODE

                       06201L      06202L     06301L      20103L      20105L      10602L      10604L      97160S
                     BICARBONT.  BICARBONT.  CARBONATE   CALCIUM     CALCIUM     HARDNESS    HARDNESS   DISCHARGE
                      (CALCD.)    (CALCD.)   (CALCD.)   DISSOLVED   DISSOLVED     TOTAL       TOTAL      INSTANT
                                                                     (CALCD.)    (CALCD.)
                SUBM   HCO3        HCO3        CO3          CA          CA        CACO3       CACO3
                 ID    MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        M3/S
SAMPLES(FLAGS)         12(2)        3(0)       12(2)       10(0)        3(0)        9(0)        3(0)
           LOW         Q106.        201.         0.         47.2        60.0       187.0       244.
          HIGH          399.        323.        35.         80.         78.2       290.3       297.0
       AVERAGE          241.*       256.         3.*        65.9        67.1       238.4       273.0
      STD.DEV.           82.*        62.        10.*        10.2         9.8        36.8        26.9
  PERCNT:10TH           143.                     0.         52.1
          25TH          177.                     0.         57.                    204.1
   MEDIAN 50TH          254.        244.         0.         68.5        63.0       257.9       278.
          75TH          283.                     0.         73.                    260.5
          90TH          323.                    Q1.         77.5
SECONDARY CODE                                          11L 10L

                       11103L      12102L     19103L      09107L      17203L      16306L      26009L      26304L
                       SODIUM     MAGNESIUM  POTASSIUM   FLUORIDE    CHLORIDE    SULPHATE      IRON        IRON
                      DISSOLVED   DISSOLVED  DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED     TOTAL      EXTRBLE.

                SUBM    NA          MG          K           F           CL          S04         FE          FE
                 ID    MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)         12(0)       12(0)       12(0)       12(0)       14(0)       12(0)        1(0)       10(0)
           LOW          30.0        14.         1.8         .12         40.         50.         2.83        .28
          HIGH         422.0        27.0        7.8         .24       1090.        208.0        2.83       4.80
       AVERAGE         242.8        19.6        4.44        .181       418.57      104.2                   1.801
      STD.DEV.         128.6         3.7        2.12        .034       286.13       48.4                   1.632
  PERCNT:10TH           37.         15.         2.00        .150        45.00       62.                     .340
          25TH         169.0        16.4        2.70        .160       260.00       73.5                    .75
   MEDIAN 50TH         240.5        19.5        3.82        .180       359.00       95.3                   1.050
          75TH         335.0        22.0        6.50        .200       514.0       105.0                   2.89
          90TH         408.0        23.0        7.3         .23        860.        193.                    4.550
SECONDARY CODE          11L         11L         11L        06L 05L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE 174                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB7800    LAT. 53D 46M 30S  LONG. 113D  4M 45S   PR 3   UTM 12 363000E 5960250N  FOR MAR 11, 1980 TO APR 18, 1984
DIAMOND SHAMROCK ALTA GAS LTD FT SASK.    FINAL EFFLUENT GRAB
SE S29 T55 R21 W4M

                           07105L      07205L      07562L      07021L      07906L      07905L      15421L      97160S
                          NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN   PHOSPHORUS  DISCHARGE
                          DISSOLVED   DISSOLVED   DISSOLVED    TOTAL    PARTICULATE PARTICULATE   TOTAL       INSTANT
                          NO3 & NO2   NITRITE     AMMONIA     KJELDAHL     TOTAL     (CALCD.)
                   SUBM      N           N           N           N           N           N           P
                    ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        M3/S
SAMPLES(FLAGS)            11(9)       11(10)      11(1)       12(0)       8(0)                    14(0)
           LOW             L.003       L.003       L.020        .600        .23                     .388
          HIGH              .15        L.050        5.00        8.17        .78                     3.2
       AVERAGE             .053*       .044*       1.081*      2.123        .415                    1.101
      STD.DEV.             .036*       .015*       1.573*      2.157        .206                    .771
  PERCNT:10TH              .026        .026         .040         .8                                 .445
          25TH             L.05        L.05         .061        .938        .245                    .480
   MEDIAN 50TH             L.05        L.05         .250       1.065        .355                    .830
          75TH             L.05        L.05        1.760       2.785        .555                   1.530
          90TH             L.050       L.05        2.800       3.750                               1.750
SECONDARY CODE            10L         06L         61L         15L                             19L 06L

                           10474L      10407L      10511L      10453L      14101L      97160S      97163S
                          RESIDUE     RESIDUE     RESIDUE     RESIDUE     SILICA     DISCHARGE   DISCHARGE
                           TOTAL    NONFILTRABLE  VOLATILE   FILTRABLE   REACTIVE     INSTANT      DAILY
                                                 NONFILTR.                                         MEAN
                   SUBM                          (CALCD.)                  SIO2
                    ID     MG/L        MG/L        MG/L        MG/L        MG/L        M3/S        CFS
SAMPLES(FLAGS)            12(0)       14(0)       1(0)        10(0)       12(0)                   10(0)
           LOW             564.          6.        29.0        550.         2.9                     .13
          HIGH             2172.        80.0       29.0        1375.        9.2                     .46
       AVERAGE             1198.0       37.4                   974.5        4.63                    .2511
      STD.DEV.             517.4        21.8                   270.9        1.60                    .1044
  PERCNT:10TH              777.         14.                    635.0        3.3                     .1350
          25TH             831.5        24.                    780.         3.80                    .15
   MEDIAN 50TH             1103.0       32.5                   950.0        4.45                    .2550
          75TH             1381.0       42.                    1170.        4.90                    .294
          90TH             2172.        77.0                   1347.5       5.3                     .4050
SECONDARY CODE            71L         01L                     51L         02L

                           00205L      02074L      06537L      06524L      02001L      16101L      10701L      06608L
                           TOTAL     TURBIDITY    PHENOLIC    OIL AND      ODOUR     SULPHIDE    SURFACT.     CYANIDE
                          DISSOLVED               MATERIAL    GREASE     THRESHOLD   DISSOLVED   N-ALKYL
                           SOLIDS                                         NUMBER                 SULPHNTS.
                   SUBM                           PHENOL                                 S          LAS          CN
                    ID     MG/L         NTU        MG/L        MG/L         TON        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            10(0)                   12(1)       10(0)                                           6(1)
           LOW             319.3                   L.002        1.2                                            .007
          HIGH             1346.0                   .034        42.0                                          L.02
       AVERAGE             857.5                    .011*       8.930                                          .0113*
      STD.DEV.             331.7                    .009*      12.338                                          .0057*
  PERCNT:10TH              355.2                    .004        1.350
          25TH             611.                     .006        1.9                                            .007
   MEDIAN 50TH             922.0                    .010        5.650                                          .0085
          75TH             1127.                    .014        7.3                                            .0170
          90TH             1249.5                   .018       28.450
SECONDARY CODE                                                 21L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE 175                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB7800    LAT. 53D 46M 30S  LONG. 113D  4M 45S   PR 3   UTM 12 363000E 5960250N  FOR MAR 11, 1980 TO APR 18, 1984
DIAMOND SHAMROCK ALTA GAS LTD FT SASK.     FINAL EFFLUENT GRAB
SE S29 T55 R21 W4M

                        08304L       08202L      06107L      06154L      06001L      06051L      06006L      06905L
                        OXYGEN       OXYGEN      CARBON      CARBON      CARBON      CARBON      CARBON      CARBON
                          TOTAL      BIOCHEM.    DISSOLVED   DISSOLVED   TOTAL       TOTAL       TOTAL       PARTICULATE
                          COD        DEMAND-BOD  ORGANIC     INORGANIC   ORGANIC     INORGANIC               TOTAL
                SUBM    02           02          C           C           C           C           C           C
                 ID     MG/L         MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)          10(0)        10(0)       8(0)        8(0)        5(0)        1(0)        1(0)        8(0)
           LOW            48.0         7.0       4.          28.         12.0        67.         350.          2.40
          HIGH          1067.0       610.0       15.0        62.0        283.        67.         350.         16.88
       AVERAGE           208.0        90.62       9.14       47.85        82.30                               7.94
      STD.DEV.           306.6       184.32       3.96       12.70       113.04                               4.86
  PERCNT:10TH             58.8         9.00
          25TH            69.9        18.0        6.40       36.90        31.6                                4.79
   MEDIAN 50TH           105.6        23.75       8.00       52.50        33.9                                6.30
          75TH           203.0        66.0       12.65       57.00        51.0                               11.01
          90TH           636.0       349.60
SECONDARY CODE          01L                                         07L 05L

                        24101L       24009L      24302L      80015L      80011L      27009L      27302L      47304L
                        CHROMIUM     CHROMIUM    CHROMIUM    MERCURY     MERCURY     COBALT      COBALT      SILVER
                        HEXAVALENT   TOTAL       EXTRBLE.    TOTAL       TOTAL       TOTAL       EXTRBLE.    EXTRBLE.

                SUBM    CR           CR          CR          HG          HG          CO          CO          AG
                 ID     MG/L         MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)                       9(1)        1(1)        10(1)                   9(6)        2(1)        1(1)
           LOW                       L.001       L.01        L.0001                  L.001       L.001       L.02
          HIGH                        .040       L.01         .0012                  L.01         .005       L.02
       AVERAGE                        .015*                   .0005*                  .003*       .003*
      STD.DEV.                        .011*                   .0004*                  .003*       .003*
  PERCNT:10TH                                                 .0001*
          25TH                        .008                    .0002                  L.001
   MEDIAN 50TH                        .012                    .0003                  L.001        .003*
          75TH                        .02                     .0010                   .003
          90TH                                                .0011
SECONDARY CODE

                        29009L       29305L      28009L      28302L      48009L      48302L      82009L      82302L
                        COPPER       COPPER      NICKEL      NICKEL      CADMIUM     CADMIUM     LEAD        LEAD
                         TOTAL       EXTRBLE.    TOTAL       EXTRBLE.    TOTAL       EXTRBLE.    TOTAL       EXTRBLE.

                SUBM    CU           CU          NI          NI          CD          CD          PB          PB
                 ID     MG/L         MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)          9(0)         2(0)        9(1)        2(0)        9(6)        2(2)        5(3)        6(3)
           LOW           .009         .015        .005        .010       L.001       L.001       L.003       L.002
          HIGH           .077         .086        .039        .010       L.01        L.001        .005        .035
       AVERAGE           .028         .051        .018*       .010        .002*                   .004*       .014*
      STD.DEV.           .021         .050        .012*       .000        .003*                   .001*       .014*
  PERCNT:10TH
          25TH           .014                     .009                   L.001                   L.003        .002
   MEDIAN 50TH           .025         .051        .015        .010       L.001       L.001       L.003       L.011
          75TH           .033                     .024                    .002                    .004        .020
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0010 -  0012 PAGE 176                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB7800    LAT. 53D 46M 30S  LONG. 113D  4M 45S   PR 3   UTM 12 363000E 5960250N  FOR MAR 11, 1980 TO APR 18, 1984
DIAMOND SHAMROCK ALTA GAS LTD FT SASK.    FINAL EFFLUENT GRAB
SE S29 T55 R21 W4M

                          30009L     30305L     25003L     25304L     23009L     42304L     42009L     51003L
                           ZINC       ZINC     MANGANESE  MANGANESE  VANADIUM  MOLYBDENUM MOLYBDENUM  ANTIMONY
                          TOTAL     EXTRBLE.     TOTAL     EXTRBLE.    TOTAL    EXTRBLE.     TOTAL      TOTAL

                 SUBM      ZN         ZN         MN         MN          V          MO         MO         SB
                  ID      MG/L       MG/L       MG/L       MG/L       MG/L       MG/L       MG/L       MG/L
SAMPLES(FLAGS)            12(0)       2(0)       9(0)       2(0)      10(2)                  8(5)       1(0)
           LOW             .054       .062       .054       .100       .001                 L.001       .007
          HIGH            1.91       1.730       .239       .10       L.01                  L.02        .007
       AVERAGE             .463       .896       .120       .100       .005*                 .005*
      STD.DEV.             .601      1.179       .055       .000       .003*                 .007*
   PERCNT:10TH             .064                                        .001*
          25TH             .078                  .096                  .002                 L.001
   MEDIAN 50TH             .249       .896       .102       .100       .004                  .002*
          75TH             .538                  .142                  .008                  .008
          90TH            1.4                                          .009*
SECONDARY CODE                                                        02L

                          33005L     33104L     34005L     34102L     13111L     13306L     04102L     04304L
                         ARSENIC    ARSENIC    SELENIUM   SELENIUM   ALUMINUM   ALUMINUM  BERYLLIUM  BERYLLIUM
                          TOTAL    DISSOLVED   TOTAL     DISSOLVED  DISSOLVED   EXTRBLE.  DISSOLVED   EXTRBLE.

                 SUBM      AS         AS         SE         SE         AL         AL         BE         BE
                  ID      MG/L       MG/L       MG/L       MG/L       UG/L       MG/L       MG/L       MG/L
SAMPLES(FLAGS)            5(0)       2(0)       5(4)       2(2)       1(0)      10(1)       1(1)       9(8)
           LOW            .0009      .0071     L.0002     L.0002     430.       L.01       L.005      L.001
          HIGH            .016       .0074      .006      L.0002     430.        .541      L.005       .001
       AVERAGE            .0076      .0073      .0014*                           .339*                 .001*
      STD.DEV.            .0061      .0002      .0026*                           .171*                 .000*
   PERCNT:10TH                                                                   .096*
          25TH            .0038                L.0002                            .205                 L.001
   MEDIAN 50TH            .0057      .0073     L.0002     L.0002                 .345                 L.001
          75TH            .0118                L.0002                            .472                 L.001
          90TH                                                                   .541
SECONDARY CODE                                 07L                              02L                   02L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE 177                          NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                         INDUSTRIAL MONITORING
STATION 20AL05EB7801    LAT. 53D 46M 30S  LONG. 113D  4M 45S   PR 3   UTM 12 363000E 5960250N  FOR MAY 06, 1982 TO MAY 06, 1982
DIAMOND SHAMROCK ALTA GAS LTD FT SASK.     FINAL EFFLUENT COMP.
SE S29 T55 R21 W4M

                          02061F      10301L      10301F      10151L      10101L      02041L      97160S      97163S
                        TEMPERATURE     PH          PH      ALKALINITY  ALKALINITY   SPECIFIC   DISCHARGE   DISCHARGE
                        OF WATER                              PHENOL       TOTAL     CONDUCT.    INSTANT      DAILY
                                                            PHTHALEIN                                         MEAN
                  SUBM                                        CACO3       CACO3
                  ID      DEG.C      PH UNITS    PH UNITS     MG/L        MG/L       US/CM        M3/S        CFS
 SAMPLES(FLAGS)                        1(0)                   1(0)        1(0)        1(0)                    1(0)
            LOW                        7.3                      .0         96.        1392.                   .290
           HIGH                        7.3                      .0         96.        1392.                   .290
        AVERAGE
       STD.DEV.
   PERCNT:10TH
           25TH
    MEDIAN 50TH
           75TH
           90TH
 SECONDARY CODE

                          06201L      06202L      06301L      20103L      20105L      10602L      10604L      97160S
                        BICARBONT.  BICARBONT.  CARBONATE    CALCIUM     CALCIUM    HARDNESS    HARDNESS    DISCHARGE
                          (CALCD.)   (CALCD.)    (CALCD.)   DISSOLVED   DISSOLVED     TOTAL       TOTAL       INSTANT
                                                                         (CALCD.)   (CALCD.)
                  SUBM    HCO3        HCO3        CO3          CA          CA         CACO3       CACO3
                  ID      MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        M3/S
 SAMPLES(FLAGS)            1(0)                    1(0)        1(0)
            LOW            117.                      0.         50.
           HIGH            117.                      0.         50.
        AVERAGE
       STD.DEV.
   PERCNT:10TH
           25TH
    MEDIAN 50TH
           75TH
           90TH
 SECONDARY CODE                                                10L

                          11103L      12102L      19103L      09107L      17203L      16306L      26009L      26304L
                          SODIUM     MAGNESIUM   POTASSIUM   FLUORIDE    CHLORIDE    SULPHATE      IRON        IRON
                        DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED     TOTAL      EXTRBLE.
                  SUBM     NA          MG          K           F           CL          S04         FE          FE
                  ID      MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
 SAMPLES(FLAGS)            1(0)                    1(0)        1(0)        1(0)        1(0)                    1(0)
            LOW            193.                    11.0         .18        255.        140.                    1.82
           HIGH            193.                    11.0         .18        255.        140.                    1.82
        AVERAGE
       STD.DEV.
   PERCNT:10TH
           25TH
    MEDIAN 50TH
           75TH
           90TH
 SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE 178                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB7801    LAT. 53D 46M 30S  LONG. 113D  4M 45S   PR 3   UTM 12 363000E 5960250N  FOR MAY 06, 1982 TO MAY 06, 1982
DIAMOND SHAMROCK ALTA GAS LTD FT SASK.     FINAL EFFLUENT COMP.
SE S29 T55 R21 W4M

                          07105L      07205L      07562L      07021L      07906L      07905L      15421L      97160S
                         NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN   PHOSPHORUS   DISCHARGE
                         DISSOLVED   DISSOLVED   DISSOLVED    TOTAL    PARTICULATE PARTICULATE   TOTAL        INSTANT
                         NO3 & NO2    NITRITE    AMMONIA     KJELDAHL     TOTAL      (CALCD.)
                  SUBM       N           N           N           N           N           N           P
                   ID      MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        M3/S
SAMPLES(FLAGS)              1(0)        1(0)        1(0)        1(0)        1(0)                    1(0)
           LOW               .80         .25       1.700       3.800         .98                   2.350
          HIGH               .80         .25       1.700       3.800         .98                   2.350
       AVERAGE
      STD.DEV.
  PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE

                          10474L      10407L      10511L      10453L      14101L      97160S      97163S
                          RESIDUE     RESIDUE     RESIDUE     RESIDUE     SILICA     DISCHARGE   DISCHARGE
                           TOTAL   NONFILTRABLE  VOLATILE   FILTRABLE    REACTIVE     INSTANT      DAILY
                                                NONFILTR.                                          MEAN
                  SUBM                          (CALCD.)                  SIO2
                   ID     MG/L        MG/L        MG/L        MG/L        MG/L        M3/S         CFS
SAMPLES(FLAGS)             1(0)        1(0)                    1(0)        1(0)                    1(0)
           LOW             971.         81.                    890.         1.8                    .290
          HIGH             971.         81.                    890.         1.8                    .290
       AVERAGE
      STD.DEV.
  PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE                                                             02L

                          00205L      02074L      06537L      06524L      02001L      16101L      10701L      06608L
                           TOTAL    TURBIDITY    PHENOLIC    OIL AND      ODOUR     SULPHIDE    SURFACT.     CYANIDE
                         DISSOLVED               MATERIAL    GREASE     THRESHOLD   DISSOLVED   N-ALKYL
                          SOLIDS                                          NUMBER                SULPHNTS.
                  SUBM                           PHENOL                                 S          LAS          CN
                   ID      MG/L        NTU        MG/L        MG/L         TON         MG/L        MG/L        MG/L
SAMPLES(FLAGS)             1(0)                   1(0)        1(0)
           LOW             724.                   .007         1.1
          HIGH             724.                   .007         1.1
       AVERAGE
      STD.DEV.
  PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
```

```
REQUEST 0007 -  0009 PAGE 179                          NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                          INDUSTRIAL MONITORING
STATION 20AL05EB7801    LAT. 53D 46M 30S  LONG. 113D  4M 45S   PR 3   UTM 12 363000E 5960250N  FOR MAY 06, 1982 TO MAY 06, 1982
DIAMOND SHAMROCK ALTA GAS LTD FT SASK.    FINAL EFFLUENT COMP.
SE S29 T55 R21 W4M

                          08304L      08202L      06107L      06154L      06001L      06051L      06006L      06905L
                          OXYGEN      OXYGEN      CARBON      CARBON      CARBON      CARBON      CARBON      CARBON
                           TOTAL     BIOCHEM.    DISSOLVED   DISSOLVED     TOTAL       TOTAL     TOTAL      PARTICULATE
                            COD     DEMAND-BOD    ORGANIC    INORGANIC    ORGANIC    INORGANIC                TOTAL
                   SUBM     02          02          C           C           C           C           C           C
                    ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)              1(0)        1(0)        1(0)        1(0)                                            1(0)
           LOW               75.9        15.8        9.          30.                                            12.62
          HIGH               75.9        15.8        9.          30.                                            12.62
       AVERAGE
      STD.DEV.
  PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE

                          24101L      24009L      24302L      80015L      80011L      27009L      27302L      47304L
                         CHROMIUM    CHROMIUM    CHROMIUM    MERCURY     MERCURY     COBALT      COBALT      SILVER
                        HEXAVALENT    TOTAL       EXTRBLE.    TOTAL       TOTAL       TOTAL      EXTRBLE.    EXTRBLE.

                   SUBM    CR          CR          CR          HG          HG          CO          CO          AG
                    ID     MG/L        MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)                          1(0)                    1(1)                    1(1)
           LOW                          .015                   L.0001                  L.001
          HIGH                          .015                   L.0001                  L.001
       AVERAGE
      STD.DEV.
  PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE

                          29009L      29305L      28009L      28302L      48009L      48302L      82009L      82302L
                          COPPER      COPPER      NICKEL      NICKEL      CADMIUM     CADMIUM     LEAD        LEAD
                           TOTAL     EXTRBLE.     TOTAL      EXTRBLE.     TOTAL      EXTRBLE.     TOTAL      EXTRBLE.

                   SUBM    CU          CU          NI          NI          CD          CD          PB          PB
                    ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)              1(0)                    1(0)                    1(1)                    1(0)
           LOW               .035                   .015                   L.001                    .016
          HIGH               .035                   .015                   L.001                    .016
       AVERAGE
      STD.DEV.
  PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
```

```
REQUEST 0010 -  0012 PAGE 180                         NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                        INDUSTRIAL MONITORING
STATION 20AL05EB7801    LAT. 53D 46M 30S  LONG. 113D  4M 45S   PR 3   UTM 12 363000E 5960250N  FOR MAY 06, 1982 TO MAY 06, 1982
DIAMOND SHAMROCK ALTA GAS LTD FT SASK.    FINAL EFFLUENT COMP.
SE S29 T55 R21 W4M

                          30009L       30305L       25003L       25304L       23009L       42304L       42009L       51003L
                           ZINC         ZINC       MANGANESE    MANGANESE     VANADIUM    MOLYBDENUM   MOLYBDENUM    ANTIMONY
                           TOTAL      EXTRBLE.       TOTAL       EXTRBLE.      TOTAL       EXTRBLE.      TOTAL        TOTAL

                   SUBM     ZN           ZN           MN           MN            V           MO           MO           SB
                    ID     MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)             1(0)                      1(0)
           LOW             .533                      .077
          HIGH             .533                      .077
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE 181                   NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                  INDUSTRIAL MONITORING
STATION 20AL05EB7803    LAT. 53D 46M 30S  LONG. 113D  4M 45S   PR 3   UTM 12 363000E 5960250N  FOR APR 20, 1983 TO AUG 04, 1983
DIAMOND SHAMROCK ALTA GAS LTD FT SASK.     STORM WATER POND - GRAB

                        02061F       10301L       10301F       10151L       10101L       02041L       97160S       97163S
                      TEMPERATURE      PH           PH       ALKALINITY   ALKALINITY    SPECIFIC    DISCHARGE    DISCHARGE
                       OF WATER                                PHENOL       TOTAL       CONDUCT.     INSTANT       DAILY
                                                             PHTHALEIN                                              MEAN
                  SUBM                                         CACO3        CACO3
                   ID   DEG.C        PH UNITS     PH UNITS     MG/L         MG/L         US/CM        M3/S          CFS
SAMPLES(FLAGS)          2(0)         2(0)                      2(0)         2(0)         2(0)
           LOW          12.0          6.9                        .0         131.         387.
          HIGH          22.0          7.5                        .0         170.         529.
       AVERAGE          17.0                                     .0         150.5        458.
      STD.DEV.           7.1                                     .0          27.6        100.
  PERCNT:10TH
          25TH
   MEDIAN 50TH          17.0          7.20                       .0         150.5        458.
          75TH
          90TH
SECONDARY CODE

                        06201L       06202L       06301L       20103L       20105L       10602L       10604L       97160S
                      BICARBONT.   BICARBONT.   CARBONATE     CALCIUM      CALCIUM     HARDNESS     HARDNESS    DISCHARGE
                       (CALCD.)     (CALCD.)     (CALCD.)    DISSOLVED    DISSOLVED     TOTAL        TOTAL       INSTANT
                                                                          (CALCD.)     (CALCD.)
                  SUBM  HCO3         HCO3         CO3          CA           CA          CACO3        CACO3
                   ID   MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         M3/S
SAMPLES(FLAGS)          2(0)         1(0)         2(0)         2(0)                      2(0)
           LOW          160.         207.          0.          40.                      145.2
          HIGH          207.         207.          0.          50.                      182.5
       AVERAGE          183.                       0.          45.0                     163.8
      STD.DEV.           34.                       0.           7.1                      26.4
  PERCNT:10TH
          25TH
   MEDIAN 50TH          183.                       0.          45.0                     163.8
          75TH
          90TH
SECONDARY CODE                                                 10L

                        11103L       12102L       19103L       09107L       17203L       16306L       26009L       26304L
                        SODIUM      MAGNESIUM    POTASSIUM     FLUORIDE     CHLORIDE     SULPHATE      IRON         IRON
                       DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED      TOTAL       EXTRBLE.

                  SUBM  NA           MG           K            F            CL           SO4          FE           FE
                   ID   MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)          2(0)         2(0)         2(0)         2(0)         2(0)         2(1)                      2(0)
           LOW          16.          11.          3.1          .14          22.          L5.                        .87
          HIGH          28.          14.          3.9          .16          36.          35.                       1.60
       AVERAGE          22.0         12.5         3.50         .150         29.00        20.0*                     1.235
      STD.DEV.           8.5          2.1          .57         .014          9.90        21.2*                      .516
  PERCNT:10TH
          25TH
   MEDIAN 50TH          22.0         12.5         3.50         .150         29.00        20.0*                     1.235
          75TH
          90TH
SECONDARY CODE
```

```
REQUEST 0004 -  0006 PAGE 182                     NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB7803    LAT. 53D 46M 30S  LONG. 113D  4M 45S   PR 3  UTM 12 363000E 5960250N  FOR APR 20, 1983 TO AUG 04, 1983
DIAMOND SHAMROCK ALTA GAS LTD FT SASK.    STORM WATER POND - GRAB

                        07105L        07205L        07562L        07021L        07906L        07905L        15421L        97160S
                       NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN    PHOSPHORUS    DISCHARGE
                      DISSOLVED     DISSOLVED     DISSOLVED        TOTAL     PARTICULATE   PARTICULATE      TOTAL       INSTANT
                      NO3 & NO2      NITRITE       AMMONIA      KJELDAHL        TOTAL       (CALCD.)
               SUBM       N             N             N             N             N             N             P
                ID       MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          M3/S
SAMPLES(FLAGS)            2(2)          2(2)          2(0)          2(0)          2(0)                        2(0)
           LOW            L.05          L.05          .009          .710           .24                        .920
          HIGH            L.05          L.05          .140         1.740          1.00                       1.000
       AVERAGE                                      .075         1.225          .620                        .960
      STD.DEV.                                      .093          .728          .537                        .057
   PERCNT:10TH
          25TH
   MEDIAN 50TH           L.050         L.050          .075         1.225          .620                        .960
          75TH
          90TH
SECONDARY CODE

                        10474L        10407L        10511L        10453L        14101L        97160S        97163S
                        RESIDUE       RESIDUE       RESIDUE       RESIDUE       SILICA      DISCHARGE     DISCHARGE
                         TOTAL     NONFILTRABLE    VOLATILE     FILTRABLE     REACTIVE       INSTANT        DAILY
                                                  NONFILTR.                                                  MEAN
               SUBM                               (CALCD.)                                  SIO2
                ID       MG/L          MG/L          MG/L          MG/L          MG/L          M3/S          CFS
SAMPLES(FLAGS)            2(0)          2(0)                        2(0)          2(0)
           LOW            260.           32.                        210.           1.8
          HIGH            452.           50.                        420.           4.0
       AVERAGE           356.0          41.0                       315.0          2.90
      STD.DEV.           135.8          12.7                       148.5          1.56
   PERCNT:10TH
          25TH
   MEDIAN 50TH           356.0          41.0                       315.0          2.90
          75TH
          90TH
SECONDARY CODE                                                                   02L

                        00205L        02074L        06537L        06524L        02001L        16101L        10701L        06608L
                         TOTAL      TURBIDITY      PHENOLIC      OIL AND        ODOUR       SULPHIDE      SURFACT.       CYANIDE
                       DISSOLVED                   MATERIAL       GREASE      THRESHOLD     DISSOLVED      N-ALKYL
                        SOLIDS                                                  NUMBER                    SULPHNTS.
               SUBM                                 PHENOL                                      S           LAS           CN
                ID       MG/L          NTU           MG/L          MG/L          TON           MG/L          MG/L          MG/L
SAMPLES(FLAGS)            2(0)                        2(0)          2(0)                                                  1(0)
           LOW            206.                        .022           3.2                                                  .003
          HIGH            239.                        .023           4.4                                                  .003
       AVERAGE           222.5                        .023         3.800
      STD.DEV.            23.3                        .001          .849
   PERCNT:10TH
          25TH
   MEDIAN 50TH           222.5                        .023         3.800
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE 183                        NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                        INDUSTRIAL MONITORING
STATION 20AL05EB7803    LAT. 53D 46M 30S  LONG. 113D  4M 45S   PR 3   UTM 12 363000E 5960250N  FOR APR 20, 1983 TO AUG 04, 1983
DIAMOND SHAMROCK ALTA GAS LTD FT SASK.     STORM WATER POND - GRAB

                        08304L       08202L       06107L       06154L       06001L       06051L       06006L       06905L
                        OXYGEN       OXYGEN       CARBON       CARBON       CARBON       CARBON       CARBON       CARBON
                          TOTAL      BIOCHEM.     DISSOLVED    DISSOLVED     TOTAL        TOTAL       TOTAL       PARTICULATE
                           COD       DEMAND-BOD   ORGANIC      INORGANIC    ORGANIC      INORGANIC                  TOTAL
                 SUBM     02            02         C            C            C            C            C           C
                  ID     MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L        MG/L
SAMPLES(FLAGS)            2(0)         2(0)         2(0)         2(0)                                               2(0)
           LOW           181.6         62.0         69.0         29.0                                               2.50
          HIGH           297.6        138.0         89.0         32.0                                               5.67
       AVERAGE           239.6        100.00        79.00        30.50                                              4.08
      STD.DEV.            82.0         53.74        14.14         2.12                                              2.24
   PERCNT:10TH
          25TH
   MEDIAN 50TH           239.6        100.00        79.00        30.50                                              4.08
          75TH
          90TH
SECONDARY CODE

                        24101L       24009L       24302L       80015L       80011L       27009L       27302L       47304L
                        CHROMIUM     CHROMIUM     CHROMIUM     MERCURY      MERCURY      COBALT       COBALT       SILVER
                        HEXAVALENT   TOTAL         EXTRBLE.    TOTAL        TOTAL        TOTAL        EXTRBLE.     EXTRBLE.

                 SUBM    CR           CR           CR           HG           HG           CO           CO           AG
                  ID     MG/L         MG/L         MG/L         MG/L         UG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)                         2(0)                      2(2)                      2(1)
           LOW                         .008                     L.0001                    L.001
          HIGH                         .011                     L.0001                     .002
       AVERAGE                         .010                                                .001*
      STD.DEV.                         .002                                                .001*
   PERCNT:10TH
          25TH
   MEDIAN 50TH                         .010                     L.0001                     .001*
          75TH
          90TH
SECONDARY CODE

                        29009L       29305L       28009L       28302L       48009L       48302L       82009L       82302L
                        COPPER       COPPER       NICKEL       NICKEL       CADMIUM      CADMIUM      LEAD         LEAD
                          TOTAL      EXTRBLE.     TOTAL        EXTRBLE.     TOTAL        EXTRBLE.     TOTAL        EXTRBLE.

                 SUBM    CU           CU           NI           NI           CD           CD           PB           PB
                  ID     MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)            2(0)                      2(0)                      2(1)                      1(1)         1(0)
           LOW            .004                      .020                     L.001                     L.003         .014
          HIGH            .007                      .022                      .002                     L.003         .014
       AVERAGE            .006                      .021                      .001*
      STD.DEV.            .002                      .001                      .001*
   PERCNT:10TH
          25TH
   MEDIAN 50TH            .006                      .021                      .001*
          75TH
          90TH
SECONDARY CODE
```

REQUEST 0010 - 0012 PAGE 184

NAQUADAT SUMMARY REPORT JAN 08, 1986
INDUSTRIAL MONITORING

STATION 20AL05EB7803 LAT. 53D 46M 30S LONG. 113D 4M 45S PR 3 UTM 12 363000E 5960250N FOR APR 20, 1983 TO AUG 04, 1983
DIAMOND SHAMROCK ALTA GAS LTD FT SASK. STORM WATER POND - GRAB

	SUBM ID	30009L ZINC TOTAL	30305L ZINC EXTRBLE.	25003L MANGANESE TOTAL	25304L MANGANESE EXTRBLE.	23009L VANADIUM TOTAL	42304L MOLYBDENUM EXTRBLE.	42009L MOLYBDENUM TOTAL	51003L ANTIMONY TOTAL
		ZN MG/L	ZN MG/L	MN MG/L	MN MG/L	V MG/L	MO MG/L	MO MG/L	SB MG/L
SAMPLES(FLAGS)		2(0)		2(0)		2(0)		2(1)	
LOW		.077		.074		.003		L.001	
HIGH		.153		.258		.006		.004	
AVERAGE		.115		.166		.005		.002*	
STD.DEV.		.054		.130		.002		.002*	
PERCNT:10TH									
25TH									
MEDIAN 50TH		.115		.166		.005		.002*	
75TH									
90TH									
SECONDARY CODE									

	SUBM ID	33005L ARSENIC TOTAL	33104L ARSENIC DISSOLVED	34005L SELENIUM TOTAL	34102L SELENIUM DISSOLVED	13111L ALUMINUM DISSOLVED	13306L ALUMINUM EXTRBLE.	04102L BERYLLIUM DISSOLVED	04304L BERYLLIUM EXTRBLE.
		AS MG/L	AS MG/L	SE MG/L	SE MG/L	AL UG/L	AL MG/L	BE MG/L	BE MG/L
SAMPLES(FLAGS)		1(0)		1(1)			2(1)		2(2)
LOW		.0018		L.0002			L.020		L.001
HIGH		.0018		L.0002			.090		L.001
AVERAGE							.055*		
STD.DEV.							.049*		
PERCNT:10TH									
25TH									
MEDIAN 50TH							.055*		L.001
75TH									
90TH									
SECONDARY CODE									

* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q

```
REQUEST 0001 -  0003 PAGE 185              NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                            INDUSTRIAL MONITORING
STATION 20AL05EB9000    LAT. 53D 50M 40S  LONG. 113D  4M 45S   PR 3   UTM 12 363200E 5968000N  FOR MAR 31, 1980 TO JUL 25, 1984
ESSO CHEMICAL CANADA LTD REDWATER          FINAL EFFLUENT GRAB
S20 T56 R21 W4M

                        02061F       10301L       10301F       10151L       10101L       02041L       97160S       97163S
                      TEMPERATURE      PH           PH       ALKALINITY   ALKALINITY    SPECIFIC    DISCHARGE    DISCHARGE
                       OF WATER                                 PHENOL       TOTAL      CONDUCT.     INSTANT       DAILY
                   SUBM                                       PHTHALEIN                                              MEAN
                    ID                                          CACO3        CACO3
                       DEG.C       PH UNITS     PH UNITS        MG/L         MG/L        US/CM         M3/S         CFS
SAMPLES(FLAGS)         17(0)        19(0)        2(0)          19(2)        19(0)        19(0)                      19(0)
           LOW          14.0          6.7          7.6            .0         32.2         314.                        .22
          HIGH          34.0          9.8          8.2          73.3         304.        3330.                        3.8
       AVERAGE          22.6                                     5.6*        125.2        1412.                     1.5091
      STD.DEV.           5.2                                    17.6*         90.4         856.                     1.0337
  PERCNT:10TH           14.5          7.2                         .0          35.         341.                        .45
          25TH          19.0         7.32                         .0          52.0         521.                        .69
   MEDIAN 50TH          23.0          7.8         7.90            .0          90.        1330.                       1.42
          75TH          25.0          8.3                         .0         192.        2220.                       1.80
          90TH          30.0          8.5                        27.5        273.        2500.                       3.41
SECONDARY CODE

                        06201L       06202L       06301L       20103L       20105L       10602L       10604L       97160S
                      BICARBONT.   BICARBONT.   CARBONATE     CALCIUM      CALCIUM     HARDNESS     HARDNESS    DISCHARGE
                       (CALCD.)     (CALCD.)     (CALCD.)    DISSOLVED    DISSOLVED      TOTAL        TOTAL      INSTANT
                                                                          (CALCD.)     (CALCD.)
                   SUBM  HCO3        HCO3          CO3           CA           CA         CACO3        CACO3
                    ID MG/L          MG/L          MG/L         MS/L         MG/L         MG/L         MG/L         M3/S
SAMPLES(FLAGS)         19(2)         6(0)         19(2)        16(0)         4(0)        14(0)         5(0)
           LOW          Q38.          56.           0.          27.1         42.6        119.1        138.0
          HIGH         Q318.         249.          88.          140.         94.6        473.1         211.
       AVERAGE         139.*         150.           7.*         71.8         59.0        269.7        181.4
      STD.DEV.          93.*          81.          21.*         27.2         24.0         83.1         31.8
  PERCNT:10TH           43.                         0.          33.0                     194.1
          25TH          63.           69.           0.          54.5         45.4        224.9        160.0
   MEDIAN 50TH          110.         149.           0.          74.5         49.4        264.7         189.
          75TH          229.         230.           0.          85.0         72.6        309.4         209.
          90TH          304.                       33.          95.0                     352.5
SECONDARY CODE                                             11L 10L

                        11103L       12102L       19103L       09107L       17203L       16306L       26009L       26304L
                        SODIUM     MAGNESIUM    POTASSIUM     FLUORIDE     CHLORIDE     SULPHATE      IRON         IRON
                      DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED      TOTAL       EXTRBLE.

                   SUBM   NA           MG           K            F            CL           SO4          FE           FE
                    ID   MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)          19(0)        19(0)        19(0)        19(0)        19(0)        19(0)         2(0)        17(0)
           LOW          11.0         12.5          1.8          .18          3.8         93.5           .3          .10
          HIGH          350.          30.         44.0         3.30        25.00        1200.          .39         2.07
       AVERAGE         103.6         18.7        10.48         .944        13.89        419.6         .345         .488
      STD.DEV.          88.1          5.2         9.42         .901         6.97        270.1         .064         .493
  PERCNT:10TH           12.          13.0          2.6          .20           4.        107.0                      .10
          25TH          16.0          14.          3.0         .450          7.5         170.                      .20
   MEDIAN 50TH          98.           18.          8.7          .64          14.         410.         .345         .370
          75TH         136.0          22.         12.6         1.16          22.        560.0                      .50
          90TH         227.0         28.0         17.5         3.15          25.        660.0                      .99
SECONDARY CODE          11L          11L          11L          06L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

NAQUADAT SUMMARY REPORT JAN 08, 1986
INDUSTRIAL MONITORING

STATION 20AL05EB9000 LAT. 53D 50M 40S LONG. 113D 4M 45S PR 3 UTM 12 363200E 5968000N FOR MAR 31, 1980 TO JUL 25, 1984
ESSO CHEMICAL CANADA LTD REDWATER FINAL EFFLUENT GRAB
S20 T56 R21 W4M

SUBM ID	07105L NITROGEN DISSOLVED NO3 & NO2 N MG/L	07205L NITROGEN DISSOLVED NITRITE N MG/L	07562L NITROGEN DISSOLVED AMMONIA N MG/L	07021L NITROGEN TOTAL KJELDAHL N MG/L	07906L NITROGEN PARTICULATE TOTAL N MG/L	07905L NITROGEN PARTICULATE (CALCD.) N MG/L	15421L PHOSPHORUS TOTAL P MG/L	97160S DISCHARGE INSTANT M3/S
SAMPLES(FLAGS)	19(0)	19(2)	19(0)	18(0)	13(0)		19(0)	
LOW	1.00	L.05	.787	1.763	.09		.375	
HIGH	98.91	22.50	152.00	258.33	2.15		9.380	
AVERAGE	28.578	1.748*	45.792	63.143	.877		2.248	
STD.DEV.	36.365	5.078*	50.126	76.738	.684		2.216	
PERCNT:10TH	1.20	L.05	.788	1.875	.31		.800	
25TH	1.65	.080	2.2	3.000	.35		.87	
MEDIAN 50TH	3.80	.25	24.700	22.625	.52		1.375	
75TH	55.00	1.170	82.03	95.000	1.31		2.480	
90TH	93.48	2.26	128.20	170.83	2.06		6.000	
SECONDARY CODE			61L	15L			19L 06L	

SUBM ID	10474L RESIDUE TOTAL MG/L	10407L RESIDUE NONFILTRABLE MG/L	10511L RESIDUE VOLATILE NONFILTR. (CALCD.) MG/L	10453L RESIDUE FILTRABLE MG/L	14101L SILICA REACTIVE SIO2 MG/L	97160S DISCHARGE INSTANT M3/S	97163S DISCHARGE DAILY MEAN CFS
SAMPLES(FLAGS)	17(0)	19(0)		16(0)	19(0)		19(0)
LOW	218.0	5.		190.	3.0		.22
HIGH	1392.	42.		1350.	8.9		3.8
AVERAGE	883.9	20.8		899.4	5.71		1.5091
STD.DEV.	379.0	9.5		357.5	1.63		1.0337
PERCNT:10TH	290.0	8.		370.	4.0		.45
25TH	529.	16.		655.0	4.4		.69
MEDIAN 50TH	906.	19.2		895.0	5.6		1.42
75TH	1255.	24.		1260.0	6.7		1.80
90TH	1345.	37.0		1310.	8.8		3.41
SECONDARY CODE		01L		51L	02L		

SUBM ID	00205L TOTAL DISSOLVED SOLIDS MG/L	02074L TURBIDITY NTU	06537L PHENOLIC MATERIAL PHENOL MG/L	06524L OIL AND GREASE MG/L	02001L ODOUR THRESHOLD NUMBER TON	16101L SULPHIDE DISSOLVED S MG/L	10701L SURFACT. N-ALKYL SULPHNTS. LAS MG/L	06608L CYANIDE CN MG/L
SAMPLES(FLAGS)	18(0)	16(0)	19(2)	19(3)			12(1)	6(2)
LOW	160.0	1.2	L.002	L.200			.01	L.002
HIGH	2272.	42.0	.560	13.0			17.31	.023
AVERAGE	894.7	11.1	.036*	1.637*			5.112*	.0097*
STD.DEV.	527.4	11.7	.127*	2.827*			6.971*	.0093*
PERCNT:10TH	278.	1.7	L.002	L.200			.02	
25TH	305.	4.4	.004	.6			.320*	.003
MEDIAN 50TH	949.5	6.4	.005	L0.			.855	.0050
75TH	1119.	15.0	.010	1.2			12.165	L.02
90TH	1572.	30.0	.020	3.0			15.71	
SECONDARY CODE		73L		21L				

* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q

```
REQUEST 0007 -  0009 PAGE 187                  NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                  INDUSTRIAL MONITORING
STATION 20AL05EB9000    LAT. 53D 50M 40S  LONG. 113D  4M 45S   PR 3   UTM 12 363200E 5968000N  FOR MAR 31, 1980 TO JUL 25, 1984
ESSO CHEMICAL CANADA LTD REDWATER          FINAL EFFLUENT GRAB
S20 T56 R21 W4M

                          08304L      08202L      06107L      06154L      06001L      06051L      06006L      06905L
                          OXYGEN      OXYGEN      CARBON      CARBON      CARBON      CARBON      CARBON      CARBON
                            TOTAL     BIOCHEM.    DISSOLVED   DISSOLVED    TOTAL       TOTAL      TOTAL       PARTICULATE
                             COD      DEMAND-BOD  ORGANIC     INORGANIC    ORGANIC     INORGANIC                TOTAL
                    SUBM    02           02         C           C            C           C           C           C
                     ID     MG/L        MG/L       MG/L        MG/L         MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)              19(0)        3(0)      14(0)       13(0)         6(2)        4(0)        3(0)       13(0)
           LOW               15.6         4.4        4.4         6.6        L0.          4.0        43.           1.30
          HIGH               85.9        26.5       18.0        56.0        14.3        58.         59.          68.63
       AVERAGE               43.4        15.30       8.55       23.95        6.73*      39.50       53.33        10.42
      STD.DEV.               20.7        11.05       3.94       17.53        6.05*      24.62        8.96        17.78
   PERCNT:10TH               17.5                    4.8         8.00                                             1.90
          25TH               26.0                    6.2        11.0        L0.         23.00                     3.07
   MEDIAN 50TH               40.0        15.0        7.75       15.0         5.00       48.00       58.           5.61
          75TH               58.0                    9.         35.0        14.1        56.00                     8.63
          90TH               81.0                   16.0        51.                                              12.24
SECONDARY CODE              01L                     01L                     05L 07L     52L

                          24101L      24009L      24302L      80015L      80011L      27009L      27302L      47304L
                          CHROMIUM    CHROMIUM    CHROMIUM    MERCURY     MERCURY     COBALT      COBALT      SILVER
                          HEXAVALENT  TOTAL        EXTRBLE.   TOTAL       TOTAL       TOTAL       EXTRBLE.    EXTRBLE.

                    SUBM    CR          CR          CR          HG          HG          CO          CO          AG
                     ID     MG/L        MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)              16(11)      18(0)                   19(16)                  18(9)        1(1)        2(2)
           LOW               L.001        .005                  L.0001                   L.001       L.001       L.02
          HIGH                .820       2.150                   .0005                   L.01        L.001       L.02
       AVERAGE                .136*       .415                   .0002*                   .003*
      STD.DEV.                .276*       .780                   .0001*                   .003*
   PERCNT:10TH               L.001        .007                  L.0001                   L.001
          25TH               L.001        .008                  L.0001                   L.001
   MEDIAN 50TH               L.001        .031                  L.0001                    .003                  L.020
          75TH                .050        .100                  L.0001                    .004
          90TH                .700       2.000                   .0005                   L.01
SECONDARY CODE

                          29009L      29305L      28009L      28302L      48009L      48302L      82009L      82302L
                          COPPER      COPPER      NICKEL      NICKEL      CADMIUM     CADMIUM     LEAD        LEAD
                           TOTAL      EXTRBLE.    TOTAL       EXTRBLE.     TOTAL      EXTRBLE.    TOTAL       EXTRBLE.

                    SUBM    CU          CU          NI          NI          CD          CD          PB          PB
                     ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)              18(0)        1(0)       18(2)        1(0)       18(12)       1(1)        7(3)       12(9)
           LOW                .002        .003        .004        .002       L.001       L.001       L.003       L.003
          HIGH                .022        .003       L.02         .002       L.01        L.001        .016       L.02
       AVERAGE                .009                    .011*                   .002*                   .006*       .006*
      STD.DEV.                .005                    .005*                   .003*                   .005*       .006*
   PERCNT:10TH                .002                    .004                   L.001                               L.003
          25TH                .006                    .007                   L.001                   L.003       L.003
   MEDIAN 50TH                .008                    .010                   L.001                    .004       L.003
          75TH                .010                    .013                    .002                    .009        .005
          90TH                .014                   L.02                    L.01                                L.02
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0010 -  0012 PAGE 188                        NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                       INDUSTRIAL MONITORING
STATION 20AL05EB9000    LAT. 53D 50M 40S  LONG. 113D  4M 45S   PR 3   UTM 12 363200E 5968000N  FOR MAR 31, 1980 TO JUL 25, 1984
ESSO CHEMICAL CANADA LTD REDWATER         FINAL EFFLUENT GRAB
S20 T56 R21 W4M

                          30009L      30305L      25003L      25304L      23009L      42304L      42009L      51003L
                           ZINC        ZINC      MANGANESE   MANGANESE   VANADIUM   MOLYBDENUM  MOLYBDENUM  ANTIMONY
                          TOTAL      EXTRBLE.     TOTAL      EXTRBLE.     TOTAL      EXTRBLE.     TOTAL       TOTAL

                  SUBM     ZN          ZN          MN          MN          V           MO          MO          SB
                   ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)            18(0)        1(0)       16(0)        1(0)       15(2)                   14(2)        2(2)
           LOW              .005        .010        .012        .007        .006                  L.001       L.001
          HIGH              .117        .010        .099        .007        .332                   .021       L.001
       AVERAGE              .040                    .054                    .037*                  .012*
      STD.DEV.              .031                    .025                    .083*                  .006*
   PERCNT:10TH              .007                    .023                    .006                   .007
          25TH              .017                    .033                    .008                   .008
    MEDIAN 50TH             .031                    .057                   L.01                    .011       L.0010
          75TH              .056                    .069                    .034                   .018
          90TH              .090                    .094                    .045                   .02
SECONDARY CODE                                                          02L

                          33005L      33104L      34005L      34102L      13111L      13306L      04102L      04304L
                          ARSENIC     ARSENIC     SELENIUM    SELENIUM    ALUMINUM    ALUMINUM    BERYLLIUM   BERYLLIUM
                          TOTAL      DISSOLVED    TOTAL      DISSOLVED   DISSOLVED    EXTRBLE.    DISSOLVED    EXTRBLE.

                  SUBM     AS          AS          SE          SE          AL          AL          BE          BE
                   ID     MG/L        MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)             9(2)        1(0)        8(7)        1(1)        2(0)       13(0)        2(2)       13(13)
           LOW            L.001        .0008      L.002       L.0002      860.          .50       L.005       L.001
          HIGH             .0026       .0008      L.0002      L.0002      570.          .880      L.005       L.001
       AVERAGE             .0029*                  .0005*                 715.00       1.353
      STD.DEV.             .0026*                  .0006*                 205.06       1.170
   PERCNT:10TH                                                                          .814                  L.001
          25TH             .0008                   .0007*                               .608                  L.001
    MEDIAN 50TH            .0065                  L.0002                  715.00        .940      L.005       L.001
          75TH             .0069                  L.0002                               1.990                  L.001
          90TH                                                                         1.800                  L.001
SECONDARY CODE                                 07L                                     02L                    02L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE 189                       NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                     INDUSTRIAL MONITORING
STATION 20AL05EB9001    LAT. 53D 50M 40S  LONG. 113D  4M 45S   PR 3   UTM 12 363200E 5968000N  FOR APR 01, 1980 TO JUL 24, 1984
ESSO CHEMICAL CANADA LTD REDWATER          FINAL EFFLUENT COMP.
S20 T56 R21 W4M

                          02061F      10301L      10301F      10151L      10101L      02041L      97160S      97163S
                        TEMPERATURE     PH          PH      ALKALINITY  ALKALINITY   SPECIFIC   DISCHARGE   DISCHARGE
                         OF WATER                             PHENOL      TOTAL      CONDUCT.    INSTANT      DAILY
                                                            PHTHALEIN                                          MEAN
                 SUBM                                         CACO3       CACO3
                  ID      DEG.C      PH UNITS    PH UNITS     MG/L        MG/L        US/CM       M3/S         CFS
SAMPLES(FLAGS)             1(0)        6(0)        1(0)       5(0)        6(0)        6(0)                    6(0)
           LOW             24.0        8.2         7.6         .0         260.        2520.                    .33
          HIGH             24.0        7.10        7.6         .0          41.5       1297.                   3.0
       AVERAGE                                                5.4         133.9       1520.                   1.2400
      STD.DEV.                                               12.1         105.2        940.                    .9926
  PERCNT:10TH
          25TH                         8.2                     .0         256.        2260.                    .48
   MEDIAN 50TH                         9.30                    .0          46.5        431.                   1.0100
          75TH                         7.4                    27.         153.        2180.                   1.61
          90TH
SECONDARY CODE

                          06201L      06202L      06301L      20103L      20105L      10602L      10604L      97160S
                        BICARBONT.  BICARBONT.  CARBONATE    CALCIUM     CALCIUM    HARDNESS    HARDNESS   DISCHARGE
                         (CALCD.)    (CALCD.)    (CALCD.)   DISSOLVED   DISSOLVED     TOTAL       TOTAL     INSTANT
                                                                        (CALCD.)    (CALCD.)
                 SUBM     HCO3        HCO3        CO3          CA          CA         CACO3       CACO3
                  ID      MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        M3/S
SAMPLES(FLAGS)             5(0)        2(0)        5(0)       4(0)        2(0)        3(0)        3(0)
           LOW             317.        186.         0.        38.0        51.7        229.9       220.
          HIGH             187.         51.         0.        95.0        49.0        344.3       151.0
       AVERAGE             173.        118.         6.        70.8        50.3        283.5       193.3
      STD.DEV.             146.         96.        14.        24.3         1.9         57.5        37.1
  PERCNT:10TH
          25TH             312.                     0.        53.5
   MEDIAN 50TH              40.        118.         0.        75.0        50.3        276.4       209.
          75TH               7.                    32.        88.0
          90TH
SECONDARY CODE                                             11L 10L

                          11103L      12102L      19103L      09107L      17203L      16306L      26009L      26304L
                          SODIUM    MAGNESIUM   POTASSIUM    FLUORIDE    CHLORIDE    SULPHATE      IRON        IRON
                        DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED   DISSOLVED     TOTAL     EXTRBLE.
                 SUBM      NA          MG          K           F           CL          SO4         FE          FE
                  ID      MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)             6(0)        6(0)        6(0)        6(0)        6(0)        6(0)        1(0)        5(0)
           LOW             121.         22.         6.3        .49         22.         461.         .05        1.00
          HIGH             141.0        26.0       11.00       .620        24.00       570.0        .05         .370
       AVERAGE              91.3        19.2        9.55       .557        16.62       398.5                    .502
      STD.DEV.              60.9         4.8        5.16       .211         7.75       215.8                    .338
  PERCNT:10TH
          25TH             104.         21.        16.0        .50         23.         393.                     .11
   MEDIAN 50TH              15.5        14.0        4.75       .515         7.35       148.5                    .38
          75TH             151.         18.        14.5        .70         16.         670.                     .65
          90TH
SECONDARY CODE            11L         11L         11L         06L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE 190                        NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                       INDUSTRIAL MONITORING
STATION 20AL05EB9001    LAT. 53D 50M 40S  LONG. 113D  4M 45S   PR 3   UTM 12 363200E 5968000N  FOR APR 01, 1980 TO JUL 24, 1984
ESSO CHEMICAL CANADA LTD REDWATER          FINAL EFFLUENT COMP.
S20 T56 R21 W4M

                        07105L      07205L      07562L      07021L      07906L       07905L       15421L      97160S
                       NITROGEN    NITROGEN    NITROGEN    NITROGEN    NITROGEN     NITROGEN    PHOSPHORUS  DISCHARGE
                       DISSOLVED   DISSOLVED   DISSOLVED    TOTAL     PARTICULATE  PARTICULATE    TOTAL       INSTANT
                       NO3 & NO2    NITRITE    AMMONIA     KJELDAHL     TOTAL        (CALCD.)
                  SUBM     N           N           N           N           N            N            P
                   ID    MG/L        MG/L        MG/L        MG/L        MG/L         MG/L         MG/L         M3/S
SAMPLES(FLAGS)           6(0)        6(0)        6(0)        6(0)        3(0)                      6(0)
           LOW          95.65        1.68       85.94      183.33         .64                      1.06
          HIGH         10.400       1.150       1.450       4.000       1.140                     1.280
       AVERAGE         39.390       3.112      44.924      74.034        .923                     1.277
      STD.DEV.         40.974       5.267      48.147      81.093        .257                     1.018
  PERCNT:10TH
          25TH          77.08        1.89       78.13      137.50                                  1.20
   MEDIAN 50TH          1.605        .101       1.511       2.188         .99                     1.937
          75TH          50.00       13.75      101.00      115.00                                  .245
          90TH
SECONDARY CODE                                  61L         15L                                    19L

                        10474L      10407L      10511L      10453L      14101L       97160S       97163S
                       RESIDUE     RESIDUE     RESIDUE     RESIDUE      SILICA      DISCHARGE    DISCHARGE
                        TOTAL    NONFILTRABLE  VOLATILE    FILTRABLE   REACTIVE      INSTANT       DAILY
                                              NONFILTR.                                             MEAN
                  SUBM                         (CALCD.)                  SIO2
                   ID    MG/L        MG/L        MG/L        MG/L        MG/L         M3/S          CFS
SAMPLES(FLAGS)           6(0)        6(0)                    5(0)        6(0)                      6(0)
           LOW          1389.          9.                   1380.         4.6                       .33
          HIGH         1074.3        24.4                  1050.0        7.00                      3.0
       AVERAGE          966.2        16.7                  1092.0        5.27                     1.2400
      STD.DEV.          476.3        10.7                   357.3        1.27                      .9926
  PERCNT:10TH
          25TH          1269.          9.                   1260.         4.6                        .48
   MEDIAN 50TH          375.0        11.5                    490.        4.60                     1.0100
          75TH          1315.         35.                   1280.         6.2                      1.61
          90TH
SECONDARY CODE                        01L                                 02L

                        00205L      02074L      06537L      06524L      02001L       16101L       10701L      06608L
                        TOTAL     TURBIDITY    PHENOLIC    OIL AND      ODOUR       SULPHIDE     SURFACT.     CYANIDE
                       DISSOLVED               MATERIAL    GREASE     THRESHOLD    DISSOLVED     N-ALKYL
                        SOLIDS                                         NUMBER                   SULPHNTS.
                  SUBM                          PHENOL                                  S          LAS          CN
                   ID    MG/L        NTU         MG/L        MG/L        TON          MG/L         MG/L        MG/L
SAMPLES(FLAGS)           6(0)        6(0)        4(1)        4(0)                                  5(0)        1(1)
           LOW          1263.         3.7        L.002       11.0                                 16.03       L.002
          HIGH          937.8         5.5        .006       1.000                                   .66       L.002
       AVERAGE          874.0         9.7        .005*      3.325                                 6.120
      STD.DEV.          476.0        11.0        .002*      5.127                                 7.855
  PERCNT:10TH
          25TH          1101.         1.8        .004*      5.650                                 13.28
   MEDIAN 50TH          289.0        16.3        .005        .650                                   .04
          75TH         1364.0        15.0        .005       1.000                                   .59
          90TH
SECONDARY CODE                        73L                    21L
```

```
REQUEST 0007 -  0009 PAGE 191                   NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                  INDUSTRIAL MONITORING
STATION 20AL05EB9001    LAT. 53D 50M 40S  LONG. 113D  4M 45S   PR 3   UTM 12 363200E 5968000N  FOR APR 01, 1980 TO JUL 24, 1984
ESSO CHEMICAL CANADA LTD REDWATER         FINAL EFFLUENT COMP.
S20 T56 R21 W4M

                        08304L      08202L      06107L      06154L      06001L      06051L      06006L      06905L
                        OXYGEN      OXYGEN      CARBON      CARBON      CARBON      CARBON      CARBON      CARBON
                         TOTAL     BIOCHEM.   DISSOLVED   DISSOLVED     TOTAL       TOTAL      TOTAL      PARTICULATE
                          COD     DEMAND-BOD   ORGANIC    INORGANIC    ORGANIC    INORGANIC                 TOTAL
                 SUBM     O2           O2         C           C           C           C           C           C
                   ID    MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           6(0)                    3(0)        3(0)        3(0)        2(0)        2(0)        3(0)
           LOW           48.0                     8.         14.          6.         55.         61.          5.45
          HIGH           44.5                     9.00       10.80       19.7        57.         59.          7.10
       AVERAGE           43.3                     7.90       21.60        9.23       56.00       60.00        6.50
      STD.DEV.            9.5                     1.15       16.01        9.28        1.41        1.41         .91
   PERCNT:10TH
          25TH           39.0
    MEDIAN 50TH          45.5                     6.7        40.0         2.         56.00       60.00        6.96
          75TH           37.0
          90TH
SECONDARY CODE         01L                                               07L

                        24101L      24009L      24302L      80015L      80011L      27009L      27302L      47304L
                       CHROMIUM    CHROMIUM    CHROMIUM     MERCURY     MERCURY     COBALT      COBALT      SILVER
                      HEXAVALENT    TOTAL      EXTRBLE.      TOTAL       TOTAL       TOTAL     EXTRBLE.    EXTRBLE.

                 SUBM     CR          CR          CR          HG          HG          CO          CO          AG
                   ID    MG/L        MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           5(2)        4(0)                    4(3)                    4(2)                    1(1)
           LOW           .540        .04                     .0010                   L.01                    L.02
          HIGH           L.001       .015                    L.0001                   .004                   L.02
       AVERAGE            .231*      .034                     .0003*                  .004*
      STD.DEV.            .301*      .028                     .0004*                  .004*
   PERCNT:10TH
          25TH            .580       .056                     .0005*                  .006*
    MEDIAN 50TH          L.01        .041                    L.0001                   .002*
          75TH            .025       .013                    L.0001                   .002*
          90TH
SECONDARY CODE

                        29009L      29305L      28009L      28302L      48009L      48302L      82009L      82302L
                        COPPER      COPPER      NICKEL      NICKEL      CADMIUM     CADMIUM      LEAD        LEAD
                        TOTAL      EXTRBLE.     TOTAL      EXTRBLE.      TOTAL      EXTRBLE.     TOTAL      EXTRBLE.

                 SUBM     CU          CU          NI          NI          CD          CD          PB          PB
                   ID    MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)           4(0)                    4(1)                    4(2)                    1(1)        3(2)
           LOW            .014                   L.02                    L.01                    L.003       L.02
          HIGH            .015                    .017                    .002                   L.003       L.003
       AVERAGE            .021                    .015*                   .004*                               .010*
      STD.DEV.            .020                    .004*                   .004*                               .009*
   PERCNT:10TH
          25TH            .009                    .017*                   .006*
    MEDIAN 50TH           .027                    .012                    .001*                               .008
          75TH            .033                    .014                    .001*
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0010 -  0012 PAGE 192                      NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                    INDUSTRIAL MONITORING
STATION 20AL05EB9001    LAT. 53D 50M 40S  LONG. 113D  4M 45S   PR 3   UTM 12 363200E 5968000N  FOR APR 29, 1981 TO JUL 24, 1984
ESSO CHEMICAL CANADA LTD REDWATER          FINAL EFFLUENT COMP.
S20 T56 R21 W4M
                           30009L      30305L      25003L      25304L      23009L      42304L      42009L      51003L
                            ZINC        ZINC      MANGANESE   MANGANESE   VANADIUM   MOLYBDENUM  MOLYBDENUM   ANTIMONY
                           TOTAL      EXTRBLE.     TOTAL      EXTRBLE.     TOTAL      EXTRBLE.     TOTAL       TOTAL

                    SUBM    ZN          ZN          MN          MN          V           MO          MO          SB
                     ID     MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)              4(0)                    3(0)                    4(1)                    4(1)        1(1)
           LOW              .1                       .064                   L.01                    L.02        L.001
          HIGH              .110                     .037                    .012                    .011       L.001
       AVERAGE              .114                     .057                    .019*                   .014*
      STD.DEV.              .031                     .017                    .016*                   .005*
  PERCNT:10TH
          25TH              .094                                             .009*                   .016*
   MEDIAN 50TH              .123                     .069                    .026                    .012
          75TH              .134                                             .028                    .011
          90TH
SECONDARY CODE
                           33005L      33104L      34005L      34102L      13111L      13306L      04102L      04304L
                           ARSENIC     ARSENIC    SELENIUM    SELENIUM    ALUMINUM    ALUMINUM   BERYLLIUM   BERYLLIUM
                          TOTAL      DISSOLVED    TOTAL      DISSOLVED   DISSOLVED    EXTRBLE.   DISSOLVED    EXTRBLE.

                    SUBM    AS          AS          SE          SE          AL          AL          BE          BE
                     ID     MG/L        MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)              4(1)                    3(2)                    1(0)        3(0)        1(1)        3(3)
           LOW             L.001                   L.001                    600.        1.200       L.005       L.001
          HIGH              .0025                  L.0002                   600.         .716       L.005       L.001
       AVERAGE              .0025*                  .0005*                              1.279
      STD.DEV.              .0025*                  .0004*                               .606
  PERCNT:10TH
          25TH              .0007*
   MEDIAN 50TH              .0033                   .0004                               1.920                   L.001
          75TH              .0043
          90TH
SECONDARY CODE                                     07L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE 193                  NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                INDUSTRIAL MONITORING
STATION 20AL05EB9003    LAT. 53D 50M 40S  LONG. 113D  4M 45S   PR 3   UTM 12 363200E 5968000N  FOR MAR 31, 1980 TO APR 04, 1984
ESSO CHEMICAL CANADA LTD REDWATER          NORTH SURFACE RUNOFF DITCH GRAB
S20 T56 R21 W4M

                      02061F        10301L        10301F        10151L        10101L        02041L        97160S        97163S
                    TEMPERATURE       PH            PH        ALKALINITY    ALKALINITY    SPECIFIC     DISCHARGE     DISCHARGE
                    OF WATER                                    PHENOL        TOTAL       CONDUCT.      INSTANT        DAILY
                                                              PHTHALEIN                                                 MEAN
               SUBM                                             CACO3         CACO3
                ID     DEG.C       PH UNITS      PH UNITS       MG/L          MG/L         US/CM         M3/S          CFS
SAMPLES(FLAGS)            10(0)         10(0)                       10(0)          7(0)         10(0)                      4(0)
           LOW              1.0           5.5                          .0           23.         3170.                      .13
          HIGH              8.0          7.40                          .0         565.6         4110.                      .13
       AVERAGE              7.6                                        .0         171.8         7816.                    .5100
      STD.DEV.              7.1                                        .0         221.0         7124.                    .7270
   PERCNT:10TH               .8          5.40                          .0                       4150.
          25TH               .5           6.0                          .0           45.         3810.                    .1550
   MEDIAN 50TH             16.0          2.70                          .0           11.        12715.                    .8900
          75TH              4.0           6.2                          .0          390.         4380.                    .8650
          90TH             12.0          7.45                          .0                       4215.
SECONDARY CODE

                      06201L        06202L        06301L        20103L        20105L        10602L        10604L        97160S
                    BICARBONT.    BICARBONT.    CARBONATE      CALCIUM       CALCIUM      HARDNESS      HARDNESS     DISCHARGE
                     (CALCD.)      (CALCD.)      (CALCD.)     DISSOLVED     DISSOLVED       TOTAL         TOTAL        INSTANT
                                                                            (CALCD.)      (CALCD.)
               SUBM    HCO3          HCO3          CO3            CA            CA          CACO3         CACO3
                ID     MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          M3/S
SAMPLES(FLAGS)             7(0)          2(0)          7(0)          7(0)          4(0)          7(0)          3(0)
           LOW              28.          476.            0.           66.         130.7         473.6          673.
          HIGH             689.          689.            0.         230.0         227.7        1706.5          818.
       AVERAGE             209.          583.            0.         205.9         175.8        1199.8         772.7
      STD.DEV.             269.          151.            0.          98.0          40.2         612.0          86.4
   PERCNT:10TH
          25TH              55.                          0.          111.         148.3         524.2
   MEDIAN 50TH              13.          583.            0.          149.         172.3         664.4          827.
          75TH             475.                          0.          315.         203.3        1795.2
          90TH
SECONDARY CODE                                                  10L

                      11103L        12102L        19103L        09107L        17203L        16306L        26009L        26304L
                      SODIUM      MAGNESIUM     POTASSIUM      FLUORIDE      CHLORIDE      SULPHATE        IRON          IRON
                    DISSOLVED     DISSOLVED     DISSOLVED     DISSOLVED     DISSOLVED     DISSOLVED       TOTAL        EXTRBLE.

               SUBM     NA            MG            K             F             CL            SO4           FE            FE
                ID     MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)             9(0)         10(0)         10(0)         10(0)         10(0)         10(0)                     10(0)
           LOW              68.           84.          32.3         19.85           37.          819.                     60.00
          HIGH            285.0         275.0         19.00         7.300         37.00        1880.0                     1.860
       AVERAGE            141.2         144.0         44.90        77.100         50.20        1599.1                    10.916
      STD.DEV.            102.0          84.8         49.93       100.928         45.28        1506.3                    17.793
   PERCNT:10TH                           92.0         32.30        47.425         33.50         905.0                    34.965
          25TH             209.           90.          25.8         33.85           26.          821.                      3.41
   MEDIAN 50TH               7.         145.0         22.25        79.500         32.00        1460.0                     4.130
          75TH             235.          210.          34.6         42.00           38.          700.                     14.84
          90TH                          260.0         23.25         8.650         48.00        1780.0                     1.010
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE 194                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB9003    LAT. 53D 50M 40S  LONG. 113D  4M 45S   PR 3   UTM 12 363200E 5968000N  FOR MAR 31, 1980 TO APR 04, 1984
ESSO CHEMICAL CANADA LTD REDWATER         NORTH SURFACE RUNOFF DITCH GRAB
S20 T56 R21 W4M

                        07105L        07205L        07562L        07021L        07906L        07905L        15421L        97160S
                        NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN      PHOSPHORUS    DISCHARGE
                        DISSOLVED     DISSOLVED     DISSOLVED     TOTAL         PARTICULATE   PARTICULATE   TOTAL         INSTANT
                        NO3 & NO2     NITRITE       AMMONIA       KJELDAHL      TOTAL         (CALCD.)
                  SUBM  N             N             N             N             N             N             P
                  ID    MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          M3/S
SAMPLES(FLAGS)          10(1)         10(1)         10(0)         7(0)          7(0)                        10(0)
           LOW          94.56         .38           97.66         191.67        5.26                        183.24
          HIGH          17.750        1.150         58.000        62.000        .660                        78.000
       AVERAGE          82.873*       .750*         494.803       213.310       2.013                       706.132
      STD.DEV.          69.525*       .797*         1036.44       137.412       1.707                       1448.43
   PERCNT:10TH          116.975       .440          171.815                                                 336.410
          25TH          71.53         .57           125.00        429.17        2.10                        235.00
   MEDIAN 50TH          25.025*       .175*         222.950       355.00        1.40                        373.500
          75TH          25.20         .85           138.00        80.000        .27                         237.00
          90TH          42.000        2.000         62.750                                                  54.750
SECONDARY CODE                                      61L           15L                                       19L

                        10474L        10407L        10511L        10453L        14101L        97160S        97163S
                        RESIDUE       RESIDUE       RESIDUE       RESIDUE       SILICA        DISCHARGE     DISCHARGE
                        TOTAL         NONFILTRABLE  VOLATILE      FILTRABLE     REACTIVE      INSTANT       DAILY
                                                    NONFILTR.                                               MEAN
                  SUBM                              (CALCD.)                    SIO2
                  ID    MG/L          MG/L          MG/L          MG/L          MG/L          M3/S          CFS
SAMPLES(FLAGS)          10(0)         10(0)                       10(0)         10(0)                       4(0)
           LOW          3245.         549.                        2900.         14.0                        .13
          HIGH          3795.6        75.6                        3720.0        32.50                       .13
       AVERAGE          6491.0        298.4                       6213.0        33.35                       .5100
      STD.DEV.          7982.3        331.7                       7896.2        21.35                       .7270
   PERCNT:10TH          4439.0        321.0                       4220.0        31.35
          25TH          3426.         36.                         3390.         23.5                        .1550
   MEDIAN 50TH          4343.5        198.5                       4145.0        32.20                       .8900
          75TH          4916.         1086.                       3830.         61.5                        .8650
          90TH          3836.3        71.3                        3765.0        35.25
SECONDARY CODE                                                                  02L

                        00205L        02074L        06537L        06524L        02001L        16101L        10701L        06608L
                        TOTAL         TURBIDITY     PHENOLIC      OIL AND       ODOUR         SULPHIDE      SURFACT.      CYANIDE
                        DISSOLVED                   MATERIAL      GREASE        THRESHOLD     DISSOLVED     N-ALKYL
                        SOLIDS                                                  NUMBER                      SULPHNTS.
                  SUBM                              PHENOL                                    S             LAS           CN
                  ID    MG/L          NTU           MG/L          MG/L          TON           MG/L          MG/L          MG/L
SAMPLES(FLAGS)          10(0)         9(0)          10(0)         10(0)                                     6(0)
           LOW          1702.         283.0         .037          3.7                                       16.03
          HIGH          3143.1        25.0          .009          .860                                      1.49
       AVERAGE          3166.4        113.9         .034          4.806                                     15.155
      STD.DEV.          2743.0        82.8          .028          6.163                                     8.410
   PERCNT:10TH          2008.0                      .068          2.500
          25TH          1678.         42.0          .045          1.4                                       25.00
   MEDIAN 50TH          2009.5        125.0         .018          1.300                                     17.205
          75TH          3083.         90.0          .010          13.7                                      14.00
          90TH          3122.0                      .024          .930
SECONDARY CODE                        73L
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE 195                       NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                         INDUSTRIAL MONITORING
STATION 20AL05EB9003    LAT. 53D 50M 40S  LONG. 113D  4M 45S   PR 3   UTM 12 363200E 5968000N  FOR MAR 31, 1980 TO APR 04, 1984
ESSO CHEMICAL CANADA LTD REDWATER          NORTH SURFACE RUNOFF DITCH GRAB
S20 T56 R21 W4M

                        08304L       08202L       06107L       06154L       06001L       06051L       06006L       06905L
                        OXYGEN       OXYGEN       CARBON       CARBON       CARBON       CARBON       CARBON       CARBON
                         TOTAL      BIOCHEM.     DISSOLVED    DISSOLVED     TOTAL        TOTAL       TOTAL       PARTICULATE
                          COD      DEMAND-BOD    ORGANIC      INORGANIC    ORGANIC     INORGANIC                   TOTAL
                 SUBM     O2           O2          C            C            C            C            C             C
                  ID     MG/L        MG/L         MG/L         MG/L         MG/L         MG/L         MG/L          MG/L
SAMPLES(FLAGS)          10(0)                     7(0)         7(0)         3(0)         3(0)         3(0)          7(0)
           LOW          134.0                    110.          32.          44.          14.          58.           35.08
          HIGH          175.0                     44.40       139.00        19.          19.          45.            3.52
       AVERAGE          148.5                     43.20        48.79        35.67        12.33        50.33         16.52
      STD.DEV.           67.9                     30.89        46.77        14.43         7.64         6.81         17.02
   PERCNT:10TH          141.0
          25TH          110.0                     17.          16.                                                 16.24
   MEDIAN 50TH           83.3                     28.0          7.5         44.           4.          48.           10.00
          75TH          167.0                     40.0         84.0                                                  3.12
          90TH          165.5
SECONDARY CODE

                        24101L       24009L       24302L       80015L       80011L       27009L       27302L       47304L
                       CHROMIUM     CHROMIUM     CHROMIUM     MERCURY      MERCURY      COBALT       COBALT       SILVER
                      HEXAVALENT     TOTAL       EXTRBLE.      TOTAL        TOTAL        TOTAL       EXTRBLE.     EXTRBLE.

                 SUBM     CR           CR           CR           HG           HG           CO           CO           AG
                  ID     MG/L         MG/L         MG/L         MG/L         UG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)           9(9)        10(0)                     10(10)                     10(0)
           LOW          L.001         .125                     L.0001                      .021
          HIGH          L.001         .025                     L.0001                      .015
       AVERAGE                        .234                                                 .026
      STD.DEV.                        .425                                                 .022
   PERCNT:10TH                        .100                     L.0001                      .019
          25TH          L.001         .048                     L.0001                      .012
   MEDIAN 50TH          L.001         .711                     L.0001                      .020
          75TH          L.001         .104                     L.0001                      .042
          90TH                        .023                     L.0001                      .012
SECONDARY CODE

                        29009L       29305L       28009L       28302L       48009L       48302L       82009L       82302L
                        COPPER       COPPER       NICKEL       NICKEL      CADMIUM      CADMIUM        LEAD         LEAD
                         TOTAL      EXTRBLE.      TOTAL       EXTRBLE.      TOTAL       EXTRBLE.      TOTAL       EXTRBLE.

                 SUBM     CU           CU           NI           NI           CD           CD           PB           PB
                  ID     MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)          10(0)                     10(0)                     10(0)                      5(1)         5(4)
           LOW           .047                      .074                      .014                      .180         .004
          HIGH           .026                      .071                      .009                      .009        L.003
       AVERAGE           .040                      .096                      .018                      .041*        .003*
      STD.DEV.           .015                      .055                      .019                      .078*        .000*
   PERCNT:10TH           .041                      .077                      .012
          25TH           .040                      .055                      .007                     L.003        L.003
   MEDIAN 50TH           .023                      .079                      .021                      .005        L.003
          75TH           .054                      .126                      .015                      .006        L.003
          90TH           .031                      .084                      .009
SECONDARY CODE
```

NAQUADAT SUMMARY REPORT JAN 08, 1986
INDUSTRIAL MONITORING

STATION 20AL05EB9003 LAT. 53D 50M 40S LONG. 113D 4M 45S PR 3 UTM 12 363200E 5968000N FOR MAR 31, 1980 TO APR 04, 1984
ESSO CHEMICAL CANADA LTD REDWATER NORTH SURFACE RUNOFF DITCH GRAB
S20 T56 R21 W4M

	30009L ZINC TOTAL	30305L ZINC EXTRBLE.	25003L MANGANESE TOTAL	25304L MANGANESE EXTRBLE.	23009L VANADIUM TOTAL	42304L MOLYBDENUM EXTRBLE.	42009L MOLYBDENUM TOTAL	51003L ANTIMONY TOTAL
SUBM	ZN	ZN	MN	MN	V	MO	MO	SB
ID	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L	MG/L
SAMPLES(FLAGS)	10(0)		10(0)		6(0)		6(0)	
LOW	.231		1.740		.084		.025	
HIGH	.051		.861		.037		.017	
AVERAGE	.372		1.441		.102		.026	
STD.DEV.	.351		.997		.071		.013	
PERCNT:10TH	.212		1.455					
25TH	.139		.932		.204		.037	
MEDIAN 50TH	.602		.998		.131		.033	
75TH	.316		2.280		.026		.013	
90TH	.081		.647					
SECONDARY CODE								

	33005L ARSENIC TOTAL	33104L ARSENIC DISSOLVED	34005L SELENIUM TOTAL	34102L SELENIUM DISSOLVED	13111L ALUMINUM DISSOLVED	13306L ALUMINUM EXTRBLE.	04102L BERYLLIUM DISSOLVED	04304L BERYLLIUM EXTRBLE.
SUBM	AS	AS	SE	SE	AL	AL	BE	BE
ID	MG/L	MG/L	MG/L	MG/L	UG/L	MG/L	MG/L	MG/L
SAMPLES(FLAGS)	3(0)		3(0)			6(0)		6(5)
LOW	.0340		.0010			9.300		L.001
HIGH	.0430		.0004			.990		L.001
AVERAGE	.0363		.0007			5.203		.002*
STD.DEV.	.0059		.0003			8.262		.002*
PERCNT:10TH								
25TH						20.400		.007
MEDIAN 50TH	.0320		.0007			.164		L.001
75TH						.200		L.001
90TH								
SECONDARY CODE								

* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q

```
REQUEST 0001 -  0003 PAGE 197                   NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                 INDUSTRIAL MONITORING
STATION 20AL05EB9004    LAT. 53D 50M 40S  LONG. 113D  4M 45S   PR 3   UTM 12 363200E 5968000N  FOR AUG 02, 1984 TO AUG 02, 1984
ESSO CHEMICAL CANADA LTD REDWATER         NORTH SURFACE RUNOFF DITCH COMP.
S20 T56 R21 W4M

                          02061F        10301L        10301F        10151L        10101L        02041L        97160S         97163S
                        TEMPERATURE       PH            PH        ALKALINITY    ALKALINITY     SPECIFIC     DISCHARGE      DISCHARGE
                        OF WATER                                    PHENOL         TOTAL       CONDUCT.      INSTANT         DAILY
                                                                  PHTHALEIN                                                  MEAN
                 SUBM                                               CACO3         CACO3
                  ID      DEG.C        PH UNITS      PH UNITS        MG/L          MG/L         US/CM          M3/S           CFS
SAMPLES(FLAGS)                                                                                                                1(0)
           LOW                                                                                                                4.5
          HIGH                                                                                                                4.5
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0005 -  0007 PAGE 198                   NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                  INDUSTRIAL MONITORING
STATION 20AL05EB9004    LAT. 53D 50M 40S  LONG. 113D  4M 45S   FR 3   UTM 12 363200E 5968000N  FOR AUG 02, 1984 TO AUG 02, 1984
ESSO CHEMICAL CANADA LTD REDWATER          NORTH SURFACE RUNOFF DITCH COMP.
S20 T56 R21 W4M

                     10474L      10407L       10511L       10453L       14101L       97160S       97163S
                    RESIDUE     RESIDUE      RESIDUE      RESIDUE      SILICA     DISCHARGE    DISCHARGE
                     TOTAL    NONFILTRABLE   VOLATILE    FILTRABLE    REACTIVE     INSTANT       DAILY
                                            NONFILTR.                                             MEAN
                SUBM                         (CALCD.)                   SIO2
                 ID  MG/L        MG/L          MG/L         MG/L        MG/L         M3/S          CFS
SAMPLES(FLAGS)                                                                                    1(0)
           LOW                                                                                   4.5
          HIGH                                                                                   4.5
       AVERAGE
      STD.DEV.
   PERCNT:10TH
          25TH
   MEDIAN 50TH
          75TH
          90TH
SECONDARY CODE
```

```
REQUEST 0001 -  0003 PAGE 199                               NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                               INDUSTRIAL MONITORING
STATION 20AL05EB9005     LAT. 53D 50M 40S  LONG. 113D  4M 45S   PR 3   UTM 12 363200E 5968000N  FOR MAR 31, 1980 TO APR 04, 1984
ESSO CHEMICAL CANADA LTD REDWATER         SOUTH SURFACE RUNOFF DITCH GRAB
S20 T56 R21 W4M

                        02061F       10301L       10301F       10151L       10101L       02041L       97160S       97163S
                      TEMPERATURE      PH           PH       ALKALINITY   ALKALINITY    SPECIFIC    DISCHARGE    DISCHARGE
                       OF WATER                                PHENOL       TOTAL       CONDUCT.     INSTANT       DAILY
                                                             PHTHALEIN                                              MEAN
                SUBM                                           CACO3        CACO3
                 ID     DEG.C       PH UNITS     PH UNITS      MG/L         MG/L        US/CM         M3/S          CFS
SAMPLES(FLAGS)           7(0)         7(0)                     7(0)         7(0)         7(0)                      3(0)
           LOW            .0          7.3                       .0          90.          956.                      .09
          HIGH           8.0          7.70                      .0         319.2        3560.                      .06
       AVERAGE           2.4                                    .0         208.9        1927.                     .0600
      STD.DEV.           2.7                                    .0         202.3        1185.                     .0300
  PERCNT:10TH
          25TH            .5          7.4                       .0         115.         1146.
   MEDIAN 50TH           3.0          8.0                       .0         628.         3700.                      .03
          75TH           3.0          7.7                       .0         129.         1694.
          90TH
SECONDARY CODE

                        06201L       06202L       06301L       20103L       20105L       10602L       10604L       97160S
                      BICARBONT.   BICARBONT.   CARBONATE     CALCIUM      CALCIUM      HARDNESS     HARDNESS    DISCHARGE
                       (CALCD.)     (CALCD.)     (CALCD.)    DISSOLVED    DISSOLVED      TOTAL        TOTAL       INSTANT
                                                                          (CALCD.)     (CALCD.)
                SUBM     HCO3         HCO3         CO3           CA           CA         CACO3        CACO3
                 ID    MG/L           MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         M3/S
SAMPLES(FLAGS)           7(0)         1(0)         7(0)         4(0)         4(0)         4(0)         3(0)
           LOW           110.         389.          0.          305.          49.0       1708.5        205.
          HIGH           389.         389.          0.          186.0        184.9        958.5        285.
       AVERAGE           255.                       0.          167.5         89.9        855.7        258.3
      STD.DEV.           247.                       0.          103.4         63.7        635.6         46.2
  PERCNT:10TH
          25TH           140.                       0.          188.0         56.0        996.4
   MEDIAN 50TH           766.                       0.           89.5         62.9        377.9        285.
          75TH           157.                       0.          147.0        123.9        714.9
          90TH
SECONDARY CODE                                                  10L

                        11103L       12102L       19103L       09107L       17203L       16306L       26009L       26304L
                        SODIUM      MAGNESIUM    POTASSIUM     FLUORIDE     CHLORIDE     SULPHATE      IRON         IRON
                      DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED    DISSOLVED      TOTAL       EXTRBLE.

                SUBM      NA           MG           K            F            CL           S04          FE           FE
                 ID     MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)           7(0)         7(0)         7(0)         7(0)         7(0)         7(0)                      7(0)
           LOW           38.          20.          22.5         3.00         52.          144.                      2.95
          HIGH          169.0        120.0         48.00        5.000        97.00       1020.0                      .140
       AVERAGE          100.4         72.4         22.56        3.673        60.86        542.7                     1.493
      STD.DEV.           94.9         77.4         12.05        1.087        20.57        594.2                     1.001
  PERCNT:10TH
          25TH           49.          31.          19.2         3.82         52.          223.                      2.15
   MEDIAN 50TH          289.         230.          10.6         2.06         49.         1700.                       .44
          75TH           65.          49.          24.1         4.80         69.          320.                      1.73
          90TH
SECONDARY CODE
```

```
REQUEST 0004 -  0006 PAGE 200                      NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                    INDUSTRIAL MONITORING
STATION 20AL05EB9005    LAT. 53D 50M 40S  LONG. 113D  4M 45S   PR 3   UTM 12 363200E 5968000N  FOR MAR 31, 1980 TO APR 04, 1984
ESSO CHEMICAL CANADA LTD REDWATER        SOUTH SURFACE RUNOFF DITCH GRAB
S20 T56 R21 W4M

                     07105L        07205L        07562L        07021L        07906L        07905L        15421L        97160S
                    NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN      NITROGEN    PHOSPHORUS     DISCHARGE
                    DISSOLVED     DISSOLVED     DISSOLVED      TOTAL      PARTICULATE   PARTICULATE     TOTAL          INSTANT
                    NO3 & NO2      NITRITE      AMMONIA      KJELDAHL       TOTAL        (CALCD.)
                SUBM    N             N             N             N             N             N             P
                 ID   MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          M3/S
SAMPLES(FLAGS)         7(0)          7(0)          7(0)          7(0)          4(0)                        7(0)
           LOW        27.88           .65         39.06         54.69           .36                        30.36
          HIGH       100.00         4.250        144.00        260.00          .360                       34.000
       AVERAGE        41.619        1.233         53.800        76.626          .675                       23.936
      STD.DEV.        28.217        1.355         41.869        82.050          .375                        8.919
  PERCNT:10TH
          25TH        24.85           .65         46.88         56.67          .620                        25.00
   MEDIAN 50TH        17.00           .55         12.000        18.500          .990                       24.250
          75TH        44.60          1.30         53.500        54.000          .730                       22.000
          90TH
SECONDARY CODE                                     61L           15L                                      19L

                     10474L        10407L        10511L        10453L        14101L        97160S        97163S
                     RESIDUE       RESIDUE       RESIDUE       RESIDUE       SILICA       DISCHARGE     DISCHARGE
                      TOTAL      NONFILTRABLE    VOLATILE     FILTRABLE     REACTIVE       INSTANT        DAILY
                                                NONFILTR.                                                  MEAN
                SUBM                            (CALCD.)                     SIO2
                 ID   MG/L          MG/L          MG/L          MG/L          MG/L          M3/S           CFS
SAMPLES(FLAGS)         7(0)          7(0)                        7(0)          7(0)                        3(0)
           LOW        992.          282.                        710.           5.4                         .09
          HIGH       2660.0          70.0                       2590.0         19.50                        .06
       AVERAGE       1737.1         172.0                       1565.1         10.89                        .0600
      STD.DEV.       1105.8          95.1                       1146.1          7.65                        .0300
  PERCNT:10TH
          25TH       1181.          301.                         880.           6.2
   MEDIAN 50TH       3857.          131.                        3726.          23.9                         .03
          75TH       1423.          223.                        1200.           9.9
          90TH
SECONDARY CODE                                                                02L

                     00205L        02074L        06537L        06524L        02001L        16101L        10701L        06608L
                      TOTAL       TURBIDITY     PHENOLIC      OIL AND        ODOUR       SULPHIDE      SURFACT.        CYANIDE
                    DISSOLVED                   MATERIAL      GREASE      THRESHOLD     DISSOLVED      N-ALKYL
                     SOLIDS                                                 NUMBER                    SULPHNTS.
                SUBM                             PHENOL                                    S             LAS            CN
                 ID   MG/L          NTU           MG/L          MG/L          TON          MG/L          MG/L          MG/L
SAMPLES(FLAGS)         7(0)          6(0)          7(0)          7(0)                                      3(0)
           LOW        542.           91.5          .020           .7                                       4.88
          HIGH       2273.6          70.0          .010          .420                                      8.59
       AVERAGE       1263.5          70.9          .018         1.374                                      6.117
      STD.DEV.        984.6          20.6          .006         1.745                                      2.142
  PERCNT:10TH
          25TH        662.           55.0          .024           .6
   MEDIAN 50TH       3035.           74.5          .014          5.3                                       4.88
          75TH        986.           60.0          .009          1.1
          90TH
SECONDARY CODE                     73L
```

```
REQUEST 0007 -  0009 PAGE 201                   NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB9005    LAT. 53D 50M 40S  LONG. 113D  4M 45S   PR 3   UTM 12 363200E 5968000N  FOR MAR 31, 1980 TO APR 04, 1984
ESSO CHEMICAL CANADA LTD REDWATER          SOUTH SURFACE RUNOFF DITCH GRAB
S20 T56 R21 W4M

                          08304L       08202L       06107L       06154L       06001L       06051L       06006L       06905L
                          OXYGEN       OXYGEN       CARBON       CARBON       CARBON       CARBON       CARBON       CARBON
                           TOTAL      BIOCHEM.    DISSOLVED    DISSOLVED      TOTAL        TOTAL       TOTAL      PARTICULATE
                            COD      DEMAND-BOD    ORGANIC     INORGANIC     ORGANIC     INORGANIC                   TOTAL
                    SUBM    02           02           C            C            C            C            C            C
                     ID    MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)             7(0)                      4(0)         4(0)         3(0)         3(0)         3(0)         4(0)
           LOW             94.0                      37.          174.         24.          22.          46.           5.26
          HIGH             96.0                      72.90         62.20       11.          23.          44.           2.48
       AVERAGE             86.6                      35.72         70.30       21.00        23.67        48.00         5.86
      STD.DEV.              9.5                      26.63         71.65        8.89         2.08         5.29         3.11
  PERCNT:10TH
          25TH             93.0                      26.00         97.00                                               5.48
    MEDIAN 50TH            92.9                      16.50         22.50       28.          26.          54.           7.85
          75TH             73.9                      45.45         43.60                                               6.24
          90TH
SECONDARY CODE

                          24101L       24009L       24302L       80015L       80011L       27009L       27302L       47304L
                         CHROMIUM     CHROMIUM     CHROMIUM     MERCURY      MERCURY      COBALT       COBALT       SILVER
                        HEXAVALENT     TOTAL       EXTRBLE.      TOTAL        TOTAL        TOTAL      EXTRBLE.     EXTRBLE.

                    SUBM    CR           CR           CR           HG           HG           CO           CO           AG
                     ID    MG/L         MG/L         MG/L         MG/L         UG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)             7(6)         7(0)                      7(7)                      7(0)
           LOW             L.001        .026                      L.0001                    .006
          HIGH             L.001        .015                      L.0001                    .007
       AVERAGE              .001*       .017                                                .007
      STD.DEV.              .001*       .006                                                .002
  PERCNT:10TH
          25TH              .003        .010                      L.0001                    .006
    MEDIAN 50TH            L.001        .020                      L.0001                    .010
          75TH             L.001        .021                      L.0001                    .007
          90TH
SECONDARY CODE

                          29009L       29305L       28009L       28302L       48009L       48302L       82009L       82302L
                          COPPER       COPPER       NICKEL       NICKEL       CADMIUM      CADMIUM      LEAD         LEAD
                           TOTAL      EXTRBLE.      TOTAL       EXTRBLE.      TOTAL       EXTRBLE.     TOTAL       EXTRBLE.

                    SUBM    CU           CU           NI           NI           CD           CD           PB           PB
                     ID    MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L
SAMPLES(FLAGS)             7(0)                      7(0)                      7(0)                      3(0)         4(1)
           LOW              .015                      .028                      .002                      .009         .008
          HIGH              .009                      .033                      .006                      .011        L.003
       AVERAGE              .021                      .029                      .004                      .009         .009*
      STD.DEV.              .025                      .006                      .002                      .002         .004*
  PERCNT:10TH
          25TH              .010                      .027                      .003                                   .011
    MEDIAN 50TH             .006                      .039                      .006                      .008         .012
          75TH              .020                      .033                      .004                                   .006*
          90TH
SECONDARY CODE
```

```
REQUEST 0010 -  0012 PAGE 202                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                   INDUSTRIAL MONITORING
STATION 20AL05EB9005    LAT. 53D 50M 40S  LONG. 113D  4M 45S   PR 3   UTM 12 363200E 5968000N  FOR MAR 31, 1980 TO APR 04, 1984
ESSO CHEMICAL CANADA LTD REDWATER         SOUTH SURFACE RUNOFF DITCH GRAB
S20 T56 R21 W4M

                          30009L      30305L      25003L      25304L      23009L      42304L      42009L      51003L
                           ZINC        ZINC      MANGANESE   MANGANESE   VANADIUM   MOLYBDENUM  MOLYBDENUM   ANTIMONY
                          TOTAL      EXTRBLE.     TOTAL      EXTRBLE.     TOTAL      EXTRBLE.     TOTAL       TOTAL

                 SUBM      ZN          ZN          MN          MN          V           MO          MO          SB
                  ID      MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)             7(0)                    7(0)                    3(0)                    3(0)
           LOW             .065                    .241                    .013                    .007
          HIGH             .033                    .223                    .026                    .012
       AVERAGE             .091                    .278                    .022                    .009
      STD.DEV.             .073                    .072                    .008                    .003
  PERCNT:10TH
          25TH             .041                    .256
  MEDIAN  50TH             .021                    .396                    .027                    .008
          75TH             .097                    .323
          90TH
SECONDARY CODE

                          33005L      33104L      34005L      34102L      13111L      13306L      04102L      04304L
                          ARSENIC     ARSENIC    SELENIUM    SELENIUM    ALUMINUM    ALUMINUM   BERYLLIUM   BERYLLIUM
                          TOTAL      DISSOLVED   TOTAL       DISSOLVED   DISSOLVED   EXTRBLE.   DISSOLVED    EXTRBLE.

                 SUBM      AS          AS          SE          SE          AL          AL          BE          BE
                  ID      MG/L        MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)             1(0)                    1(1)                                3(0)                    3(3)
           LOW             .0250                  L.0002                               .043                   L.001
          HIGH             .0250                  L.0002                               .171                   L.001
       AVERAGE                                                                         .454
      STD.DEV.                                                                         .604
  PERCNT:10TH
          25TH
  MEDIAN  50TH                                                                        1.147                   L.001
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0001 -  0003 PAGE 203                       NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                      INDUSTRIAL MONITORING
STATION 20AL05EC1000    LAT. 53D 53M 45S  LONG. 112D 55M  0S   PR 3   UTM 12 374050E 5973400N  FOR JUL 15, 1983 TO JUN 05, 1984
SIL SILICA LTD. BRUDERHEIM                    SETTLING POND EFFLUENT GRAB
SW S9 T57 R20 W4M

                       02061F         10301L         10301F         10151L         10101L         02041L         97160S         97163S
                     TEMPERATURE        PH             PH         ALKALINITY     ALKALINITY      SPECIFIC      DISCHARGE      DISCHARGE
                     OF WATER                                       PHENOL          TOTAL        CONDUCT.       INSTANT         DAILY
                                                                  PHTHALEIN                                                      MEAN
                SUBM                                                CACO3          CACO3
                 ID    DEG.C          PH UNITS       PH UNITS       MG/L           MG/L           US/CM          M3/S           CFS
SAMPLES(FLAGS)          2(0)           2(0)                         1(0)           2(0)           2(0)
           LOW          17.0           8.10                           .0          113.6           306.
          HIGH          16.0           8.30                           .0          144.5           389.
       AVERAGE          16.5                                                      129.0           348.
      STD.DEV.            .7                                                       21.8            59.
  PERCNT:10TH
          25TH
   MEDIAN 50TH          16.5           8.20                                       129.0           348.
          75TH
          90TH
SECONDARY CODE

                       06201L         06202L         06301L         20103L         20105L         10602L         10604L         97160S
                     BICARBONT.     BICARBONT.     CARBONATE       CALCIUM        CALCIUM       HARDNESS       HARDNESS      DISCHARGE
                      (CALCD.)       (CALCD.)       (CALCD.)      DISSOLVED      DISSOLVED        TOTAL          TOTAL         INSTANT
                                                                                 (CALCD.)       (CALCD.)
                SUBM    HCO3           HCO3           CO3             CA             CA           CACO3          CACO3
                 ID    MG/L           MG/L           MG/L            MG/L           MG/L           MG/L           MG/L           M3/S
SAMPLES(FLAGS)          1(0)           2(0)           1(0)           2(0)                          2(0)
           LOW          138.           138.             0.           34.0                          122.0
          HIGH          138.           176.             0.           46.0                          164.3
       AVERAGE                         157.                          40.0                          143.1
      STD.DEV.                          27.                           8.5                           29.9
  PERCNT:10TH
          25TH
   MEDIAN 50TH                         157.                          40.0                          143.1
          75TH
          90TH
SECONDARY CODE                                               10L

                       11103L         12102L         19103L         09107L         17203L         16306L         26009L         26304L
                       SODIUM       MAGNESIUM      POTASSIUM      FLUORIDE       CHLORIDE       SULPHATE         IRON           IRON
                     DISSOLVED      DISSOLVED      DISSOLVED      DISSOLVED      DISSOLVED      DISSOLVED        TOTAL        EXTRBLE.

                SUBM     NA             MG             K              F              CL            SO4             FE             FE
                 ID    MG/L           MG/L           MG/L           MG/L           MG/L           MG/L           MG/L           MG/L
SAMPLES(FLAGS)          2(0)           2(0)           2(0)           2(0)           2(0)           2(0)                          2(0)
           LOW           7.0            9.0           1.60           .140           3.00           35.0                         1.640
          HIGH          12.0           12.0           1.70           .180           7.00           52.0                          .350
       AVERAGE           9.5           10.5           1.65           .160           5.00           43.5                          .995
      STD.DEV.           3.5            2.1            .07           .028           2.83           12.0                          .912
  PERCNT:10TH
          25TH
   MEDIAN 50TH           9.5           10.5           1.65           .160           5.00           43.5                          .995
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0004 -  0006 PAGE 204                      NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                    INDUSTRIAL MONITORING
STATION 20AL05EC1000    LAT. 53D 53M 45S  LONG. 112D 55M  0S   PR 3   UTM 12 374050E 5973400N  FOR APR 11, 1984 TO JUN 05, 1984
SIL SILICA LTD. BRUDERHEIM                SETTLING POND EFFLUENT GRAB
SW S9 T57 R20 W4M

                       07105L       07205L       07562L       07021L       07906L       07905L       15421L       97160S
                      NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN     NITROGEN    PHOSPHORUS   DISCHARGE
                      DISSOLVED    DISSOLVED    DISSOLVED     TOTAL     PARTICULATE  PARTICULATE    TOTAL        INSTANT
                      NO3 & NO2     NITRITE     AMMONIA     KJELDAHL       TOTAL       (CALCD.)
               SUBM      N            N            N            N            N            N            P
                ID      MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         MG/L         M3/S
SAMPLES(FLAGS)          2(0)         2(1)         1(0)         2(0)         1(0)                      1(0)
           LOW          .190        L.050         .026         .900         .410                      .102
          HIGH          .450         .060         .026         .720         .410                      .102
       AVERAGE          .320         .055*                     .810
      STD.DEV.          .184         .007*                     .127
  PERCNT:10TH
          25TH
   MEDIAN 50TH          .320         .055*                     .810
          75TH
          90TH
SECONDARY CODE

                       10474L       10407L       10511L       10453L       14101L       97160S       97163S
                       RESIDUE      RESIDUE      RESIDUE      RESIDUE      SILICA      DISCHARGE    DISCHARGE
                        TOTAL     NONFILTRABLE   VOLATILE    FILTRABLE    REACTIVE      INSTANT       DAILY
                                               NONFILTR.                                              MEAN
               SUBM                             (CALCD.)                   SIO2
                ID      MG/L         MG/L         MG/L         MG/L         MG/L         M3/S          CFS
SAMPLES(FLAGS)          2(0)         3(0)                      2(0)         2(0)
           LOW          316.         116.                      200.         3.10
          HIGH          429.8         30.8                     330.0        1.00
       AVERAGE          372.9         82.2                     265.0        2.05
      STD.DEV.           80.5         45.2                      91.9        1.48
  PERCNT:10TH
          25TH
   MEDIAN 50TH          372.9         99.8                     265.0        2.05
          75TH
          90TH
SECONDARY CODE                                                             02L

                       00205L       02074L       06537L       06524L       02001L       16101L       10701L       06608L
                        TOTAL      TURBIDITY    PHENOLIC      OIL AND       ODOUR      SULPHIDE     SURFACT.      CYANIDE
                      DISSOLVED                 MATERIAL      GREASE     THRESHOLD    DISSOLVED     N-ALKYL
                       SOLIDS                                              NUMBER                  SULPHNTS.
               SUBM                              PHENOL                                   S           LAS           CN
                ID      MG/L          NTU         MG/L         MG/L          TON         MG/L         MG/L         MG/L
SAMPLES(FLAGS)          2(0)         2(0)         2(1)
           LOW          158.6         80.0        L.002
          HIGH          219.3         80.0         .003
       AVERAGE          189.0         80.0         .002*
      STD.DEV.           42.9           .0         .001*
  PERCNT:10TH
          25TH
   MEDIAN 50TH          189.0         80.0         .002*
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
REQUEST 0007 -  0009 PAGE 205                    NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                                  INDUSTRIAL MONITORING
STATION 20AL05EC1000    LAT. 53D 53M 45S  LONG. 112D 55M  0S   PR 3   UTM 12 374050E 5973400N  FOR APR 11, 1984 TO JUN 05, 1984
SIL SILICA LTD. BRUDERHEIM               SETTLING POND EFFLUENT GRAB
SW S9 T57 R20 W4M

                        08304L        08202L        06107L        06154L        06001L        06051L        06006L        06905L
                        OXYGEN        OXYGEN        CARBON        CARBON        CARBON        CARBON        CARBON        CARBON
                         TOTAL       BIOCHEM.      DISSOLVED     DISSOLVED       TOTAL         TOTAL       TOTAL       PARTICULATE
                          COD       DEMAND-BOD      ORGANIC      INORGANIC      ORGANIC      INORGANIC                    TOTAL
                SUBM      02            02            C             C             C             C             C             C
                 ID      MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)           2(0)                        1(0)          1(0)                                                  1(0)
           LOW           17.7                        5.00          35.20                                                  2.67
          HIGH           19.5                        5.00          35.20                                                  2.67
       AVERAGE           18.6
      STD.DEV.            1.3
   PERCNT:10TH
          25TH
   MEDIAN 50TH           18.6
          75TH
          90TH
SECONDARY CODE

                        24101L        24009L        24302L        80015L        80011L        27009L        27302L        47304L
                       CHROMIUM      CHROMIUM      CHROMIUM      MERCURY       MERCURY       COBALT        COBALT        SILVER
                      HEXAVALENT      TOTAL        EXTRBLE.       TOTAL         TOTAL         TOTAL        EXTRBLE.      EXTRBLE.

                SUBM      CR            CR            CR            HG            HG            CO            CO            AG
                 ID      MG/L          MG/L          MG/L          MG/L          UG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)           1(1)          2(0)                        2(2)                        2(0)
           LOW           L.001          .004                       L.0001                       .005
          HIGH           L.001          .006                       L.0001                       .003
       AVERAGE                          .005                                                    .004
      STD.DEV.                          .001                                                    .001
   PERCNT:10TH
          25TH
   MEDIAN 50TH                          .005                       L.0001                       .004
          75TH
          90TH
SECONDARY CODE

                        29009L        29305L        28009L        28302L        48009L        48302L        82009L        82302L
                        COPPER        COPPER        NICKEL        NICKEL        CADMIUM       CADMIUM       LEAD          LEAD
                         TOTAL       EXTRBLE.       TOTAL        EXTRBLE.       TOTAL        EXTRBLE.      TOTAL        EXTRBLE.

                SUBM      CU            CU            NI            NI            CD            CD            PB            PB
                 ID      MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L          MG/L
SAMPLES(FLAGS)           2(0)                        2(0)                        2(1)                                      2(2)
           LOW            .005                        .016                        .002                                     L.003
          HIGH            .003                        .012                       L.001                                     L.003
       AVERAGE            .004                        .014                        .001*
      STD.DEV.            .001                        .003                        .001*
   PERCNT:10TH
          25TH
   MEDIAN 50TH            .004                        .014                        .001*                                    L.003
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

```
                                          NAQUADAT SUMMARY REPORT  JAN 08, 1986
                                            INDUSTRIAL MONITORING
STATION 20AL05EC1000    LAT. 53D 53M 45S  LONG. 112D 55M  0S   PR 3   UTM 12 374050E 5973400N  FOR APR 11, 1984 TO JUN 05, 1984
SIL SILICA LTD. BRUDERHEIM                SETTLING POND EFFLUENT GRAB
SW S9 T57 R20 W4M

                      30009L      30305L      25003L      25304L      23009L      42304L      42009L      51003L
                       ZINC        ZINC     MANGANESE   MANGANESE    VANADIUM   MOLYBDENUM  MOLYBDENUM   ANTIMONY
                      TOTAL      EXTRBLE.     TOTAL      EXTRBLE.     TOTAL      EXTRBLE.     TOTAL       TOTAL

                SUBM   ZN          ZN          MN          MN          V           MO          MO          SB
                 ID   MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)         2(0)                    2(0)                    2(0)                    2(0)
           LOW         .021                    .166                    .009                    .005
          HIGH         .005                    .025                    .005                    .005
       AVERAGE         .013                    .096                    .007                    .005
      STD.DEV.         .011                    .100                    .003                    .000
  PERCNT:10TH
          25TH
   MEDIAN 50TH         .013                    .096                    .007                    .005
          75TH
          90TH
SECONDARY CODE

                      33005L      33104L      34005L      34102L      13111L      13306L      04102L      04304L
                      ARSENIC     ARSENIC    SELENIUM    SELENIUM    ALUMINUM    ALUMINUM   BERYLLIUM   BERYLLIUM
                     TOTAL      DISSOLVED   TOTAL       DISSOLVED   DISSOLVED    EXTRBLE.   DISSOLVED    EXTRBLE.

                SUBM   AS          AS          SE          SE          AL          AL          BE          BE
                 ID   MG/L        MG/L        MG/L        MG/L        UG/L        MG/L        MG/L        MG/L
SAMPLES(FLAGS)        2(0)                    2(2)                                2(0)                    2(2)
           LOW        .0043                   L.0002                              3.990                   L.001
          HIGH        .0011                   L.0002                               .298                   L.001
       AVERAGE        .0027                                                       2.144
      STD.DEV.        .0023                                                       2.611
  PERCNT:10TH
          25TH
   MEDIAN 50TH        .0027                   L.0002                              2.144                   L.001
          75TH
          90TH
SECONDARY CODE
* THESE STATISTICS INCLUDE VALUES FLAGGED WITH L,G OR Q
```

SECTION 4

Analytical data from the zoobenthos study conducted in 1982 in the study section of the North Saskatchewan River.

RIVER: North Saskatchewan River
SITE: Devon Left Bank
DATE: 17/05/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	1	-
NEMATODA					
undetermined	7	5	2	-	2
Mermithoidea	2	-	1	-	-
TURBELLARIA	-	-	1	-	-
OLIGOCHAETA					
Tubificidae	4	6	-	-	1
Naididae	4	4	2	4	-
Enchytraeidae	12	8	11	8	12
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Gammarus	-	-	-	-	-
EPHEMEROPTERA					
Ephemerella	30	19	12	12	12
Baetis	8	10	6	4	9
Tricorythodes	-	-	-	-	-
Caenis	-	-	2	1	-
Rhithrogena	17	12	8	6	10
Heptagenia	-	-	-	-	-
Heptageniidae	-	-	1	3	8
Ephemeridae	-	1	-	-	-
undetermined Nymphules	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	1	-	4	4	-
Cheumatopsyche	11	-	-	-	3
Hydropsychidae	-	-	-	-	-
Glossosoma	1	-	-	-	-
Brachycentrus	-	-	4	6	3
Oecetis	-	-	1	-	-
Triaenodes	-	-	1	-	-
Psychomyia	-	-	1	-	-
Lepidostoma	-	-	-	-	-
Neureclipsis	-	-	-	-	-
Onocosmoecus	-	-	-	-	-
Hydroptila	1	-	-	-	-
Ceraclea	-	-	-	-	-
Leptoceridae	-	-	-	-	-

SITE: Devon Left Bank
DATE: 17/05/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
PLECOPTERA					
Isoperla	6	6	5	2	3
Alloperla	17	3	2	3	1
Isogenus	-	2	-	-	-
Pteronarcys	-	-	-	-	-
Taenionema	-	-	-	-	-
Undetermined Plecoptera	-	-	-	-	-
COLLEMBOLA	-	-	-	-	-
LEPIDOPTERA	-	-	-	-	-
ODONATA	-	-	-	-	-
HEMIPTERA	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	2	4	1	6	3
Tanytarsini	6	6	2	5	-
Orthocladiinae	42	66	36	37	41
Tanypodinae	1	1	-	-	-
Pupae/Adults	-	-	1	-	-
Ceratopogonidae	1	1	22	5	25
Tipulidae	-	-	-	-	-
Simuliidae	-	-	2	2	1
Rhagionidae	-	-	-	-	-
Culicidae	-	-	-	-	-
Tanyderidae	-	-	1	-	-
Empididae	3	13	13	3	9
COLEOPTERA					
Adults undetermined	-	-	-	-	-
Elmidae Larvae	-	-	-	-	-
Elmidae Adults	-	-	-	-	-
ACARI	3	3	3	2	1
MOLLUSCA					
Physidae	-	-	-	-	-
Lymnaeidae	-	-	-	-	-
Planorbidae	-	-	-	-	-
Ancylidae					
Ferrissia	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	-	1	-
Sphaerium	-	-	-	-	-

RIVER: North Saskatchewan River
SITE: Devon Right Bank
DATE: 17/05/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	1	-
NEMATODA					
Undetermined	5	2	3	-	1
Mermithoidea	-	-	4	-	1
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	-	-	1	1	1
Naididae	4	3	8	1	3
Enchytraeidae	14	11	53	2	1
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Gammarus	-	-	-	-	-
EPHEMEROPTERA					
Ephemerella	18	23	21	3	6
Baetis	13	8	13	3	7
Tricorythodes	-	-	-	-	-
Caenis	-	-	-	-	-
Rhithrogena	6	9	3	3	12
Heptagenia	-	1	-	-	-
Heptageniidae	6	2	3	3	2
Ephemeridae	-	1	-	-	-
Undetermined Nymphules	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	-	1	-	-	-
Cheumatopsyche	1	2	-	1	1
Hydropsychidae	-	-	-	-	-
Glossosoma	-	1	2	-	-
Brachycentrus	-	-	1	-	4
Oecetis	-	-	-	-	1
Triaenodes	-	-	-	-	-
Psychomyia	-	-	1	-	-
Lepidostoma	-	-	-	-	-
Neureclipsis	-	-	-	-	-
Onocosmoecus	-	-	-	-	-
Hydroptila	-	-	-	-	-
Ceraclea	-	-	-	-	-
Leptoceridae	-	-	-	-	-

SITE: **Devon Right Bank**
DATE: 17/05/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
PLECOPTERA					
Isoperla	6	9	4	-	5
Alloperla	5	2	6	4	3
Isogenus	-	-	-	-	-
Pteronarcys	-	-	-	-	-
Taenionema	-	-	-	-	-
Undetermined Plecoptera	-	-	-	-	-
COLLEMBOLA	-	-	-	-	-
LEPIDOPTERA	-	-	-	-	-
ODONATA	-	-	-	-	-
HEMIPTERA	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	12	9	1	1	-
Tanytarsini	1	1	3	3	2
Orthocladiinae	66	23	40	43	41
Tanypodinae	-	-	-	-	-
Pupae/Adults	-	1	-	-	-
Ceratopogonidae	-	-	2	-	1
Tipulidae	-	-	-	-	-
Simuliidae	-	2	2	1	-
Rhagionidae	-	-	-	-	-
Culicidae	-	-	-	-	-
Tanyderidae	-	-	-	-	-
Empididae	1	1	4	1	3
COLEOPTERA					
Adults undetermined	-	-	-	-	-
Elmidae Larvae	-	-	-	-	-
Elmidae Adults	-	-	-	-	-
ACARI	-	3	1	-	2
MOLLUSCA					
Physidae	-	-	-	-	-
Lymnaeidae	-	-	-	-	-
Planorbidae	-	-	-	-	1
Ancylidae					
Ferrissia	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-

RIVER: North Saskatchewan River
SITE: E. L. Smith Left Bank
DATE: 03/06/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
Undetermined	4	30	1	8	8
Mermithoidea	2	2	-	6	1
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	-	5	2	9	1
Naididae	215	197	163	310	197
Enchytraeidae	14	13	3	13	4
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Gammarus	-	-	-	-	-
EPHEMEROPTERA					
Ephemerella	54	21	33	40	28
Baetis	11	4	6	7	3
Tricorythodes	3	-	-	1	1
Caenis	-	-	-	-	-
Rhithrogena	5	1	-	2	-
Heptagenia	1	4	-	2	-
Heptageniidae	3	-	2	-	1
Ephemeridae	-	-	-	-	1
Undetermined Nymphules	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	16	-	16	13	3
Cheumatopsyche	23	-	33	39	-
Hydropsychidae	-	-	-	-	-
Glossosoma	1	-	2	1	2
Brachycentrus	1	1	1	-	-
Oecetis	1	-	1	-	3
Triaenodes	-	-	-	-	-
Psychomyia	1	1	-	1	-
Lepidostoma	1	-	1	-	-
Neureclipsis	-	1	-	1	1
Onocosmoecus	-	-	-	-	-
Hydroptila	-	-	-	-	-
Ceraclea	-	-	-	-	-
Leptoceridae	-	-	-	-	-

SITE: **E. L. Smith Left Bank**
DATE: 03/06/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
PLECOPTERA					
Isoperla	1	-	-	3	-
Alloperla	3	1	3	3	2
Isogenus	-	-	-	-	-
Pteronarcys	-	-	-	1	-
Taenionema	-	-	-	-	-
Undetermined Plecoptera	-	-	1	-	-
COLLEMBOLA	-	-	-	-	-
LEPIDOPTERA	-	-	-	-	-
ODONATA	-	-	-	-	1
HEMIPTERA	2	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	5	18	5	6	9
Tanytarsini	10	6	12	8	1
Orthocladiinae	15	15	10	14	14
Tanypodinae	11	14	6	9	21
Pupae/Adults	2	-	3	5	2
Ceratopogonidae	2	2	1	1	2
Tipulidae	-	-	-	-	-
Simuliidae	-	-	-	-	-
Rhagionidae	1	-	-	1	-
Culicidae	-	-	-	-	-
Tanyderidae	-	-	-	-	-
Empididae	15	9	9	29	11
COLEOPTERA					
Adults undetermined	1	-	-	-	-
Elmidae Larvae	-	-	1	1	-
Elmidae Adults	-	-	-	-	-
ACARI	5	3	6	5	2
MOLLUSCA					
Physidae	-	-	-	-	-
Lymnaeidae	-	-	-	-	-
Planorbidae	-	-	-	-	-
Ancylidae					
Ferrissia	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-

RIVER: North Saskatchewan River
SITE: E. L. Smith Right Bank
DATE: 03/06/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
undetermined	9	8	7	8	17
Mermithoidea	1	2	5	2	3
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	-	-	-	-	-
Naididae	105	45	99	102	137
Enchytraeidae	4	3	8	5	8
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Gammarus	-	-	-	-	-
EPHEMEROPTERA					
Ephemerella	13	9	20	14	34
Baetis	2	6	3	1	3
Tricorythodes	-	1	-	-	-
Caenis	-	-	-	-	-
Rhithrogena	4	1	3	-	1
Heptagenia	3	-	-	2	2
Heptageniidae	2	-	4	3	2
Ephemeridae	-	-	-	-	-
undetermined Nymphules	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	11	3	13	3	9
Cheumatopsyche	20	16	33	22	25
Hydropsychidae	2	2	1	1	1
Glossosoma	1	3	2	1	2
Brachycentrus	-	-	-	1	-
Oecetis	-	-	1	-	-
Triaenodes	-	-	-	-	-
Psychomyia	1	-	-	1	2
Lepidostoma	-	-	-	-	-
Neureclipsis	-	-	-	-	-
Onocosmoecus	-	-	-	-	-
Hydroptila	-	-	-	-	-
Ceraclea	-	-	-	-	1
Leptoceridae	-	-	-	-	1

SITE: **E. L. Smith Right Bank**
DATE: 03/06/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
PLECOPTERA					
Isoperla	-	3	-	-	-
Alloperla	1	1	-	-	2
Isogenus	-	-	-	-	-
Pteronarcys	-	-	-	-	-
Taenionema	-	-	-	-	-
undetermined Plecoptera	1	-	1	-	-
COLLEMBOLA	-	-	-	-	-
LEPIDOPTERA	-	-	-	-	-
ODONATA	-	-	-	-	-
HEMIPTERA	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	-	-	3	2	2
Tanytarsini	4	1	2	3	5
Orthocladiinae	7	7	10	5	6
Tanypodinae	6	6	7	1	11
Pupae/Adults	1	-	1	-	1
Ceratopogonidae	-	-	-	-	-
Tipulidae	-	-	-	-	-
Simuliidae	-	-	-	-	-
Rhagionidae	-	-	-	-	-
Culicidae	-	-	-	-	-
Tanyderidae	-	-	-	-	-
Empididae	10	2	15	12	12
COLEOPTERA					
Adults undetermined	-	-	-	-	-
Elmidae Larvae	-	-	-	-	-
Elmidae Adults	-	-	-	-	-
ACARI	1	3	9	5	7
MOLLUSCA					
Physidae	-	-	-	-	-
Lymnaeidae	-	-	-	-	-
Planorbidae	-	-	-	-	-
Ancylidae					
Ferrissia	-	-	-	2	-
Sphaeriidae					
Pisidium	1	-	-	-	-
Sphaerium	-	-	-	-	-

RIVER: **North Saskatchewan River**
SITE: **Rossdale Right Bank**
DATE: 17/05/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
undetermined	11	11	29	35	28
Mermithoidea	13	14	15	11	8
TURBELLARIA	-	1	-	-	-
OLIGOCHAETA					
Tubificidae	9	19	38	25	32
Naididae	10	18	24	10	9
Enchytraeidae	5	3	12	5	4
HIRUDINEA	1	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Gammarus	-	-	-	-	-
EPHEMEROPTERA					
Ephemerella	40	35	41	27	29
Baetis	20	24	6	2	8
Tricorythodes	3	1	3	1	1
Caenis	1	1	1	-	-
Rhithrogena	5	3	-	-	1
Heptagenia	1	-	-	-	1
Heptageniidae	7	-	-	-	1
Ephemeridae	1	-	1	-	-
Undetermined Nymphules	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	3	5	1	1	1
Cheumatopsyche	12	17	12	4	4
Hydropsychidae	-	-	-	-	-
Glossosoma	2	-	-	-	-
Brachycentrus	1	-	-	-	-
Oecetis	-	1	1	1	-
Triaenodes	-	-	-	-	-
Psychomyia	-	-	-	2	-
Lepidostoma	-	-	-	-	-
Neureclipsis	-	-	-	-	-
Onocosmoecus	-	-	-	-	-
Hydroptila	-	-	-	-	-
Ceraclea	-	-	-	-	-
Leptoceridae	-	-	-	-	-

SITE: Rossdale Right Bank
DATE: 17/05/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
PLECOPTERA					
Isoperla	6	1	-	-	1
Alloperla	7	2	1	3	5
Isogenus	-	-	1	2	-
Pteronarcys	-	-	-	1	-
Taenionema	-	-	-	1	-
undetermined Plecoptera	-	-	-	-	-
COLLEMBOLA	-	-	-	-	-
LEPIDOPTERA	-	-	-	-	-
ODONATA	-	-	-	-	-
HEMIPTERA	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	2	4	4	6	15
Tanytarsini	4	12	11	6	7
Orthocladiinae	314	231	284	197	274
Tanypodinae	-	3	4	1	4
Pupae/Adults	6	3	4	3	4
Ceratopogonidae	1	6	1	2	-
Tipulidae	-	1	-	-	-
Simuliidae	1	-	1	2	-
Rhagionidae	-	-	-	-	-
Culicidae	-	-	-	-	-
Tanyderidae	-	-	-	-	-
Empididae	21	43	33	38	30
COLEOPTERA					
Adults undetermined	-	-	1	-	-
Elmidae Larvae	-	-	-	-	-
Elmidae Adults	-	-	1	-	-
ACARI	5	9	14	8	3
MOLLUSCA					
Physidae	-	-	-	-	-
Lymnaeidae	-	-	-	-	-
Planorbidae	-	-	-	-	-
Ancylidae					
Ferrissia	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-

RIVER: North Saskatchewan River
SITE: Rossdale Left Bank
DATE: 03/06/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	1	-	-
NEMATODA					
Undetermined	4	11	24	16	-
Mermithoidea	11	5	28	16	4
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	1	1	-	12	-
Naididae	13	12	28	64	44
Enchytraeidae	-	-	4	4	-
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Gammarus	-	-	-	-	-
EPHEMEROPTERA					
Ephemerella	12	8	48	52	52
Baetis	34	11	88	68	84
Tricorythodes	-	1	-	8	-
Caenis	-	-	-	-	-
Rhithrogena	12	5	56	36	28
Heptagenia	5	-	4	-	-
Heptageniidae	4	2	36	28	24
Ephemeridae	-	-	-	-	-
Undetermined Nymphules	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	4	8	20	20	8
Cheumatopsyche	3	1	12	1	8
Hydropsychidae	2	1	12	4	4
Glossosoma	-	-	1	12	2
Brachycentrus	-	-	-	-	-
Oecetis	-	-	-	-	-
Triaenodes	-	-	-	-	-
Psychomyia	1	-	-	-	2
Lepidostoma	-	-	-	-	-
Neureclipsis	-	-	-	-	-
Onocosmoecus	-	-	-	-	-
Hydroptila	-	-	-	-	-
Ceraclea	-	-	-	-	-
Leptoceridae	-	-	-	-	-

SITE: Rossdale Left Bank
DATE: 03/06/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
PLECOPTERA					
Isoperla	9	3	44	28	40
Alloperla	7	3	16	12	24
Isogenus	-	1	8	8	-
Pteronarcys	-	-	-	-	-
Taenionema	-	-	-	-	-
undetermined Plecoptera	-	-	16	-	4
COLLEMBOLA	-	-	-	-	-
LEPIDOPTERA	-	-	-	-	-
ODONATA	-	-	-	-	-
HEMIPTERA	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	4	-	4	12	-
Tanytarsini	2	-	-	-	-
Orthocladiinae	111	83	286	212	152
Tanypodinae	7	1	16	12	12
Pupae/Adults	11	6	28	32	8
Ceratopogonidae	4	-	4	4	-
Tipulidae	-	-	-	-	-
Simuliidae	-	-	-	-	-
Rhagionidae	-	-	-	-	-
Culicidae	-	-	-	-	-
Tanyderidae	-	-	-	-	-
Empididae	7	1	8	4	4
COLEOPTERA					
Adults undetermined	-	-	-	-	-
Elmidae Larvae	-	-	-	-	-
Elmidae Adults	-	-	-	-	-
ACARI					
MOLLUSCA					
Physidae	-	-	-	-	-
Lymnaeidae	-	-	-	-	-
Planorbidae	-	-	-	-	-
Ancylidae					
Ferrissia	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-

RIVER:North Saskatchewan River
SITE: 50th Street Left Bank
DATE: 03/06/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
undetermined	24	30	48	24	28
Mermithoidea	-	2	3	-	5
TURBELLARIA	-	2	3	7	-
OLIGOCHAETA					
Tubificidae	61	20	48	81	31
Naididae	58	47	115	72	74
Enchytraeidae	-	-	-	-	-
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Gammarus	-	-	-	-	-
EPHEMEROPTERA					
Ephemerella	22	22	20	12	59
Baetis	3	4	2	-	-
Tricorythodes	22	12	16	12	36
Caenis	-	-	-	-	-
Rhithrogena	-	-	-	-	-
Heptagenia	-	2	-	-	-
Heptageniidae	1	4	7	1	10
Ephemeridae	-	-	-	-	1
undetermined Nymphules	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	-	-	3	1	6
Cheumatopsyche	-	1	-	-	1
Hydropsychidae	-	-	-	-	-
Glossosoma	-	1	-	-	1
Brachycentrus	-	-	-	-	-
Oecetis	-	-	-	-	-
Triaenodes	-	-	-	-	-
Psychomyia	1	-	1	1	3
Lepidostoma	-	-	-	-	-
Neureclipsis	-	-	-	-	-
Onocosmoecus	-	-	-	-	-
Hydroptila	-	-	-	-	-
Ceraclea	-	-	-	-	-
Leptoceridae	-	-	-	-	-

SITE: 50th Street Left Bank
DATE: 03/06/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
PLECOPTERA					
Isoperla	-	2	1	-	2
Alloperla	-	3	1	-	1
Isogenus	-	-	-	-	-
Pteronarcys	-	-	-	-	-
Taenionema	-	-	-	-	-
undetermined Plecoptera	1	2	-	1	-
COLLEMBOLA	-	-	-	-	-
LEPIDOPTERA	-	-	-	-	-
ODONATA	-	-	-	-	-
HEMIPTERA	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	11	9	13	15	4
Tanytarsini	-	2	5	1	2
Orthocladiinae	32	26	55	42	34
Tanypodinae	13	7	7	1	16
Pupae/Adults	2	2	-	2	5
Ceratopogonidae	1	3	1	3	3
Tipulidae	-	-	-	-	-
Simuliidae	-	-	-	-	-
Rhagionidae	-	-	-	-	-
Culicidae	-	-	-	-	-
Tanyderidae	-	-	-	-	-
Empididae	1	2	2	-	11
COLEOPTERA					
Adults undetermined	-	-	-	-	-
Elmidae Larvae	-	-	-	1	-
Elmidae Adults	-	-	-	-	-
ACARI	1	3	3	2	6
MOLLUSCA					
Physidae	-	-	-	-	-
Lymnaeidae	-	-	-	-	-
Planorbidae	-	-	-	-	-
Ancylidae	-	-	-	-	-
Ferrissia	2	4	8	-	11
Sphaeriidae	-	-	-	-	-
Pisidium	-	2	-	-	1
Sphaerium	-	-	-	-	-

RIVER:North Saskatchewan River
SITE: 50th Street Right Bank
DATE: 03/06/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
undetermined	20	54	6	30	6
Mermithoidea	24	8	3	8	14
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	16	24	7	5	4
Naididae	8	24	19	30	18
Enchytraeidae	-	3	1	-	1
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Gammarus	-	-	-	-	-
EPHEMEROPTERA					
Ephemerella	80	28	49	40	25
Baetis	8	5	5	3	10
Tricorythodes	4	1	2	5	-
Caenis	-	-	-	-	-
Rhithrogena	-	-	-	-	-
Heptagenia	-	-	-	-	-
Heptageniidae	4	2	2	2	1
Ephemeridae	-	-	-	-	-
undetermined Nymphules	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	4	1	3	4	1
Cheumatopsyche	4	-	3	-	1
Hydropsychidae	1	-	2	2	-
Glossosoma	4	-	2	1	-
Brachycentrus	-	-	-	-	-
Oecetis	-	-	-	-	-
Triaenodes	-	-	-	-	-
Psychomyia	2	-	-	-	1
Lepidostoma	-	-	-	-	-
Neureclipsis	-	-	-	-	-
Onocosmoecus	-	-	-	-	-
Hydroptila	-	-	-	-	-
Ceraclea	-	-	-	-	-
Leptoceridae	-	-	-	-	-

SITE: 50th Street Right Bank
DATE: 03/06/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
PLECOPTERA					
Isoperla	8	1	5	5	8
Alloperla	12	1	3	4	8
Isogenus	-	-	-	-	-
Pteronarcys	-	-	-	-	-
Taenionema	-	-	1	-	-
undetermined Plecoptera	-	-	-	1	-
COLLEMBOLA	-	-	-	-	-
LEPIDOPTERA	-	-	-	-	-
ODONATA	-	-	-	-	-
HEMIPTERA	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	20	31	14	3	10
Tanytarsini	-	3	3	4	1
Orthocladiinae	80	23	44	51	51
Tanypodinae	12	3	15	5	8
Pupae/Adults	16	3	8	11	8
Ceratopogonidae	-	-	1	-	-
Tipulidae	-	-	-	-	-
Simuliidae	-	-	-	-	-
Rhagionidae	-	-	-	-	-
Culicidae	-	-	-	-	-
Tanyderidae	-	-	-	-	-
Empididae	-	1	1	2	2
COLEOPTERA					
Adults undetermined	-	-	-	-	-
Elmidae Larvae	-	-	-	1	-
Elmidae Adults	-	-	-	-	-
ACARI	4	7	8	8	5
MOLLUSCA					
Physidae	-	-	-	-	-
Lymnaeidae	-	-	-	-	-
Planorbidae	-	-	-	-	-
Ancylidae					
Ferrissia	-	1	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-

RIVER: North Saskatchewan River
SITE: Rundle Left Bank
DATE: 20/05/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
undetermined	15	16	36	45	45
Mermithoidea	1	14	13	8	9
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	4	2	-	-	1
Naididae	1	12	9	3	4
Enchytraeidae	1	3	2	2	3
HIRUDINEA					
CRUSTACEA	-	-	-	-	-
Amphipoda					
Hyalella					
Gammarus	-	-	-	-	-
EPHEMEROPTERA	-	-	-	-	-
Ephemerella	31	50	14	52	43
Baetis	8	13	6	20	13
Tricorythodes	1	1	-	-	-
Caenis	-	-	-	-	-
Rhithrogena	5	10	2	11	28
Heptagenia	1	2	-	1	-
Heptageniidae	5	3	1	4	10
Ephemeridae	-	-	-	-	-
undetermined Nymphules	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	2	1	2	3	1
Cheumatopsyche	1	-	-	-	-
Hydropsychidae	-	-	-	-	-
Glossosoma	-	-	-	-	-
Brachycentrus	-	-	-	-	-
Oecetis	-	-	-	-	-
Triaenodes	-	-	-	-	-
Psychomyia	-	-	-	-	-
Lepidostoma	-	-	-	-	-
Neureclipsis	-	-	-	-	-
Onocosmoecus	-	-	-	-	-
Hydroptila	-	-	-	-	-
Ceraclea	-	-	-	-	-
Leptoceridae	-	-	-	-	-

SITE: **Rundle Left Bank**
DATE: 20/05/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
PLECOPTERA					
Isoperla	7	7	8	22	17
Alloperla	6	12	1	7	8
Isogenus	1	-	-	1	-
Pteronarcys	-	-	-	-	-
Taenionema	-	-	-	-	-
Undetermined Plecoptera	-	-	-	-	-
COLLEMBOLA	-	-	-	1	-
LEPIDOPTERA	2	1	1	5	8
ODONATA	-	-	-	-	-
HEMIPTERA	1	-	-	-	1
DIPTERA					
Chironomidae					
Chironomini	105	28	15	13	37
Tanytarsini	1	2	-	1	-
Orthocladiinae	49	91	26	40	66
Tanypodinae	-	1	1	4	1
Pupae/Adults	1	4	2	5	8
Ceratopogonidae	1	1	1	1	2
Tipulidae	-	-	-	-	-
Simuliidae	-	-	-	1	-
Rhagionidae	-	-	-	-	-
Culicidae	-	-	-	-	-
Tanyderidae	-	-	-	-	-
Empididae	5	3	1	6	2
COLEOPTERA					
Adults undetermined	-	1	-	16	-
Elmidae Larvae	-	-	-	1	-
Elmidae Adults	-	-	-	1	-
ACARI	9	22	6	13	17
MOLLUSCA					
Physidae	-	-	-	-	-
Lymnaeidae	-	-	-	-	-
Planorbidae	-	-	-	-	-
Ancylidae					
Ferrissia	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-

RIVER: North Saskatchewan River
SITE: Rundle Right Bank
DATE: 03/06/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
undetermined	-	-	16	12	-
Mermithoidea	-	-	-	-	-
TURBELLARIA	428	-	8	-	-
OLIGOCHAETA					
Tubificidae	125	66	91	315	67
Naididae	1248	1806	667	1538	2172
Enchytraeidae	-	19	-	-	-
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Gammarus	-	-	-	-	-
EPHEMEROPTERA					
Ephemerella	68	68	52	128	112
Baetis	20	12	8	40	28
Tricorythodes	-	-	-	-	-
Caenis	-	-	-	-	-
Rhithrogena	-	-	-	-	8
Heptagenia	-	-	-	-	-
Heptageniidae	-	-	-	-	-
Ephemeridae	-	-	-	-	-
undetermined Nymphules	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	8	-	12	8	4
Cheumatopsyche	4	4	20	-	4
Hydropsychidae	-	-	-	-	-
Glossosoma	-	-	-	-	-
Brachycentrus	-	-	-	-	-
Oecetis	-	-	-	-	-
Triaenodes	-	-	-	-	-
Psychomyia	-	-	-	-	-
Lepidostoma	-	-	-	-	-
Neureclipsis	-	-	-	-	-
Onocosmoecus	-	-	-	-	-
Hydroptila	-	-	-	-	-
Ceraclea	-	-	-	-	-
Leptoceridae	-	-	-	-	-

SITE: **Rundle Right Bank**
DATE: 03/06/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
PLECOPTERA					
Isoperla	12	-	4	28	28
Alloperla	-	-	4	16	8
Isogenus	-	-	4	-	4
Pteronarcys	-	-	-	-	-
Taenionema	-	-	-	-	-
undetermined Plecoptera	-	-	-	-	-
COLLEMBOLA	-	-	-	-	-
LEPIDOPTERA	-	-	-	-	-
ODONATA	-	-	-	-	-
HEMIPTERA	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	40	80	60	40	52
Tanytarsini	-	4	-	4	8
Orthocladiinae	148	100	88	120	156
Tanypodinae	4	8	8	4	8
Pupae/Adults	32	24	28	32	44
Ceratopogonidae	-	-	-	-	-
Tipulidae	-	-	-	-	-
Simuliidae	-	-	-	-	-
Rhagionidae	-	-	-	-	-
Culicidae	-	-	-	-	-
Tanyderidae	-	-	-	-	-
Empididae	4	-	-	4	-
COLEOPTERA					
Adults undetermined	-	-	-	-	-
Elmidae Larvae	-	-	-	-	-
Elmidae Adults	-	-	-	-	-
ACARI					
MOLLUSCA					
Physidae	-	-	-	-	-
Lymnaeidae	-	-	-	-	-
Planorbidae	-	-	-	-	-
Ancylidae					
Ferrissia	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-

RIVER: North Saskatchewan River
SITE: Beverly Bridge Left Bank
DATE: 20/05/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
undetermined	23	67	19	10	9
Mermithoidea	36	40	52	40	4
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	9	9	10	2	2
Naididae	8	15	17	2	7
Enchytraeidae	4	25	13	4	1
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Gammarus	-	-	-	-	-
EPHEMEROPTERA					
Ephemerella	103	89	140	99	41
Baetis	14	10	17	20	6
Tricorythodes	8	14	10	9	5
Caenis	-	-	-	-	-
Rhithrogena	6	2	3	1	1
Heptagenia	1	1	3	-	1
Heptageniidae	3	1	6	3	4
Ephemeridae	-	-	-	-	-
undetermined Nymphules	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	3	6	8	8	1
Cheumatopsyche	2	2	4	2	4
Hydropsychidae	-	-	-	-	-
Glossosoma	1	3	1	-	-
Brachycentrus	-	-	-	-	-
Oecetis	-	-	-	-	-
Triaenodes	-	-	-	-	-
Psychomyia	3	4	3	1	1
Lepidostoma	-	-	-	-	-
Neureclipsis	-	-	-	-	-
Onocosmoecus	-	-	-	-	-
Hydroptila	-	-	-	-	-
Ceraclea	-	-	-	-	-
Leptoceridae	-	-	-	-	-

SITE: **Beverly Bridge Left Bank**
DATE: 20/05/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
PLECOPTERA					
Isoperla	10	13	16	13	2
Alloperla	3	2	4	3	2
Isogenus	1	-	2	-	2
Pteronarcys	-	-	1	-	-
Taenionema	1	-	-	-	-
Undetermined Plecoptera	-	-	-	-	-
COLLEMBOLA	-	-	1	3	-
LEPIDOPTERA	-	-	-	1	-
ODONATA	-	1	-	-	-
HEMIPTERA	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	26	56	9	14	9
Tanytarsini	2	3	2	7	2
Orthocladiinae	106	261	174	150	93
Tanypodinae	2	4	8	5	4
Pupae/Adults	2	1	3	-	1
Ceratopogonidae	2	7	3	1	1
Tipulidae	-	-	-	-	-
Simuliidae	-	-	-	1	-
Rhagionidae	-	-	-	-	-
Culicidae	-	-	-	-	-
Tanyderidae	-	-	-	-	-
Empididae	18	30	32	4	14
COLEOPTERA					
Adults undetermined	-	-	-	-	-
Elmidae Larvae	-	-	-	-	1
Elmidae Adults	-	-	-	-	-
ACARI	21	16	34	12	22
MOLLUSCA					
Physidae	-	-	-	-	-
Lymnaeidae	-	-	-	-	-
Planorbidae	-	-	-	-	-
Ancylidae					
Ferrissia	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-

RIVER: North Saskatchewan River
SITE: Beverly Bridge Right Bank
DATE: 17/05/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
Undetermined	9	-	16	14	16
Mermithoidea	19	30	16	11	10
TURBELLARIA	-	1	-	-	-
OLIGOCHAETA					
Tubificidae	51	33	4	4	28
Naididae	25	27	27	31	34
Enchytraeidae	-	1	5	-	1
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Gammarus	-	-	-	-	-
EPHEMEROPTERA					
Ephemerella	-	7	4	4	2
Baetis	3	3	1	2	-
Tricorythodes	-	-	-	1	1
Caenis	-	-	-	-	-
Rhithrogena	-	1	-	-	-
Heptagenia	-	-	-	-	-
Heptageniidae	-	-	-	1	-
Ephemeridae	-	-	-	-	-
Undetermined Nymphules	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	-	1	-	-	1
Cheumatopsyche	-	-	-	-	-
Hydropsychidae	-	-	-	-	-
Glossosoma	1	1	-	-	-
Brachycentrus	-	-	-	-	-
Oecetis	-	-	-	-	-
Triaenodes	-	-	-	-	-
Psychomyia	-	1	-	-	-
Lepidostoma	-	-	-	-	-
Neureclipsis	-	-	-	-	-
Onocosmoecus	-	-	-	-	-
Hydroptila	-	-	-	-	-
Ceraclea	-	-	-	-	-
Leptoceridae	-	-	-	-	-

SITE: **Beverly Bridge Right Bank**
DATE: 17/05/82 Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
PLECOPTERA					
Isoperla	-	3	-	-	-
Alloperla	-	1	-	-	-
Isogenus	-	-	-	-	-
Pteronarcys	-	-	-	-	-
Taenionema	-	-	-	-	-
undetermined Plecoptera	-	-	-	1	-
COLLEMBOLA	1	-	-	-	-
LEPIDOPTERA	-	-	-	-	-
ODONATA	-	-	1	-	-
HEMIPTERA	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	84	101	39	52	30
Tanytarsini	1	-	-	-	-
Orthocladiinae	223	214	244	267	200
Tanypodinae	2	1	-	-	-
Pupae/Adults	1	9	3	5	1
Ceratopogonidae	-	-	-	-	2
Tipulidae					
Simuliidae	-	2	-	1	-
Rhagionidae	-	-	-	-	-
Culicidae	-	-	-	-	-
Tanyderidae	-	-	-	-	-
Empididae	4	7	4	5	1
COLEOPTERA					
Adults undetermined	-	-	-	-	-
Elmidae Larvae	-	-	-	-	-
Elmidae Adults	-	-	-	-	-
ACARI	2	-	-	2	1
MOLLUSCA					
Physidae	-	-	-	-	-
Lymnaeidae	-	-	-	-	-
Planorbidae	-	-	-	-	-
Ancylidae					
Ferrissia	-	1	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-

RIVER: North Saskatchewan River
SITE: Cloverdale Left Bank
DATE: 20/05/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
undetermined	4	24	4	4	48
Mermithoidea	-	8	12	5	32
TURBELLARIA	-	-	-	-	8
OLIGOCHAETA					
Tubificidae	1420	392	932	521	504
Naididae	92	56	40	17	36
Enchytraeidae	-	-	-	-	-
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Gammarus	-	-	-	-	-
EPHEMEROPTERA					
Ephemerella	-	4	-	14	8
Baetis	-	-	-	-	1
Tricorythodes	-	16	-	4	4
Caenis	-	-	-	-	-
Rhithrogena	-	-	-	-	-
Heptagenia	-	-	-	5	-
Heptageniidae	-	-	-	-	-
Ephemeridae	-	-	-	-	-
undetermined Nymphules	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	-	1	-	-	2
Cheumatopsyche	-	-	-	-	-
Hydropsychidae	-	-	-	-	-
Glossosoma	-	-	-	-	-
Brachycentrus	-	-	-	-	-
Oecetis	-	-	-	-	-
Triaenodes	-	-	-	-	-
Psychomyia	-	-	-	-	-
Lepidostoma	-	-	-	-	-
Neureclipsis	-	-	-	-	-
Onocosmoecus	-	-	-	-	-
Hydroptila	-	-	-	-	-
Ceraclea	-	-	-	-	-
Leptoceridae	-	-	-	-	-

SITE: **Cloverdale Left Bank**
DATE: 20/05/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
PLECOPTERA					
Isoperla	-	4	1	3	6
Alloperla	-	-	-	1	1
Isogenus	-	-	-	-	-
Pteronarcys	-	-	-	-	-
Taenionema	-	-	-	-	-
undetermined Plecoptera	-	-	-	-	-
COLLEMBOLA	-	1	-	-	-
LEPIDOPTERA	-	-	-	-	-
ODONATA	-	1	-	-	-
HEMIPTERA	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	204	28	120	89	72
Tanytarsini	-	4	-	-	4
Orthocladiinae	96	80	108	57	128
Tanypodinae	-	-	-	2	-
Pupae/Adults	4	8	-	3	-
Ceratopogonidae	-	-	-	3	-
Tipulidae	-	-	-	-	-
Simuliidae	-	-	-	-	-
Rhagionidae	-	-	-	-	-
Culicidae	-	-	-	-	-
Tanyderidae	-	-	-	-	-
Empididae	-	4	-	1	4
COLEOPTERA					
Adults undetermined	-	-	-	-	-
Elmidae Larvae	-	-	-	-	-
Elmidae Adults	-	-	-	-	-
ACARI	-	8	-	2	-
MOLLUSCA					
Physidae	-	-	-	-	-
Lymnaeidae	-	-	-	-	-
Planorbidae	-	-	-	-	-
Ancylidae					
Ferrissia	-	4	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-

SITE: **Cloverdale Right Bank**
DATE: 20/05/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
PLECOPTERA					
Isoperla	-	-	1	-	-
Alloperla	-	-	-	-	-
Isogenus	-	-	-	-	-
Pteronarcys	-	-	-	-	-
Taenionema	-	-	-	-	-
undetermined Plecoptera	-	-	-	-	-
COLLEMBOLA	-	1	-	-	-
LEPIDOPTERA	-	-	-	-	-
ODONATA	-	-	-	-	-
HEMIPTERA	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	316	372	111	120	144
Tanytarsini	4	-	1	-	-
Orthocladiinae	380	676	304	304	436
Tanypodinae	4	8	8	4	4
Pupae/Adults	8	20	7	8	16
Ceratopogonidae	-	4	-	-	8
Tipulidae	-	-	-	1	-
Simuliidae	-	1	-	-	-
Rhagionidae	-	-	-	-	-
Culicidae	-	-	-	-	-
Tanyderidae	-	-	-	-	-
Empididae	-	-	2	-	-
COLEOPTERA					
Adults undetermined	1	-	1	-	-
Elmidae Larvae	-	-	-	-	-
Elmidae Adults	-	-	-	-	-
ACARI					
MOLLUSCA					
Physidae	-	-	-	-	-
Lymnaeidae	-	-	-	-	1
Planorbidae	-	-	-	-	-
Ancylidae	-	-	-	-	-
Ferrissia	-	1	5	8	4
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-

RIVER: North Saskatchewan River
SITE: Cloverdale Right Bank
DATE: 20/05/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
Undetermined	24	12	1	12	28
Mermithoidea	40	16	13	16	8
TURBELLARIA	-	-	-	12	8
OLIGOCHAETA					
Tubificidae	1008	544	175	888	316
Naididae	344	196	49	212	252
Enchytraeidae	-	-	-	-	-
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Gammarus	-	-	-	-	-
EPHEMEROPTERA					
Ephemerella	-	2	5	8	-
Baetis	-	-	-	1	-
Tricorythodes	-	8	5	4	16
Caenis	-	-	-	-	-
Rhithrogena	-	-	-	-	-
Heptagenia	-	-	-	-	-
Heptageniidae	-	-	-	-	-
Ephemeridae	-	-	-	-	-
Undetermined Nymphules	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	-	-	-	-	-
Cheumatopsyche	-	-	-	-	-
Hydropsychidae	-	-	-	-	-
Glossosoma	-	-	1	-	-
Brachycentrus	-	-	-	-	-
Oecetis	-	-	-	-	-
Triaenodes	-	-	-	-	-
Psychomyia	-	-	1	-	-
Lepidostoma	-	-	-	-	-
Neureclipsis	-	-	-	-	-
Onocosmoecus	-	-	-	-	-
Hydroptila	-	-	-	-	-
Ceraclea	-	-	-	-	-
Leptoceridae	-	-	-	-	-

RIVER: North Saskatchewan River
SITE: Fort Saskatchewan Left Bank
DATE: 20/05/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
undetermined	33	33	18	190	141
Mermithoidea	16	28	51	50	15
TURBELLARIA	2	7	-	-	4
OLIGOCHAETA					
Tubificidae	93	33	6	8	38
Naididae	8	8	11	14	6
Enchytraeidae	43	15	10	57	64
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Gammarus	-	-	-	-	-
EPHEMEROPTERA					
Ephemerella	50	49	58	2	24
Baetis	11	12	19	-	2
Tricorythodes	1	2	-	-	-
Caenis	-	-	-	-	-
Rhithrogena	-	1	-	-	-
Heptagenia	-	-	-	-	-
Heptageniidae	-	-	1	-	-
Ephemeridae	-	-	-	-	-
undetermined Nymphules	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	48	68	110	1	32
Cheumatopsyche	-	1	-	-	1
Hydropsychidae	-	-	-	-	-
Glossosoma	8	22	33	1	5
Brachycentrus	-	-	-	-	-
Oecetis	-	-	-	-	-
Triaenodes	-	-	-	-	-
Psychomyia	-	-	-	-	-
Lepidostoma	-	-	-	-	-
Neureclipsis	-	-	-	-	-
Onocosmoecus	-	-	-	-	-
Hydroptila	-	-	-	-	-
Ceraclea	-	-	-	-	-
Leptoceridae	-	-	-	-	-

SITE: **Fort Saskatchewan Left Bank**
DATE: 20/05/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
PLECOPTERA					
Isoperla	3	8	2	-	-
Alloperla	4	1	8	-	-
Isogenus	-	-	-	-	-
Pteronarcys	-	-	-	-	-
Taenionema	-	-	1	-	-
undetermined Plecoptera	-	-	-	-	-
COLLEMBOLA	-	1	-	-	-
LEPIDOPTERA	-	-	-	-	-
ODONATA	-	-	-	-	-
HEMIPTERA	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	23	13	19	43	30
Tanytarsini	1	2	1	-	-
Orthocladiinae	276	215	184	21	221
Tanypodinae	1	1	7	-	-
Pupae/Adults	1	2	1	-	1
Ceratopogonidae	1	1	2	1	6
Tipulidae	-	-	-	-	-
Simuliidae	-	-	-	-	-
Rhagionidae	-	-	-	-	-
Culicidae	-	-	-	-	-
Tanyderidae	-	-	-	-	-
Empididae	4	3	2	-	-
COLEOPTERA					
Adults undetermined	-	-	-	-	-
Elmidae Larvae	-	-	-	-	-
Elmidae Adults	-	-	-	-	-
ACARI	11	14	27	-	3
MOLLUSCA					
Physidae	-	-	-	-	-
Lymnaeidae	-	-	-	-	-
Planorbidae	-	-	-	-	-
Ancylidae					
Ferrissia	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-

RIVER: North Saskatchewan River Sorted By: B. Wright
SITE: Fort Saskatchewan Right Bank Counts and Identification: A. M. Anderson
DATE: 20/05/82

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
Undetermined	4	12	-	-	4
Mermithoidea	140	20	60	20	152
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	672	176	512	376	532
Naididae	28	12	-	8	36
Enchytraeidae	-	-	-	-	-
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Gammarus	-	-	-	-	-
EPHEMEROPTERA					
Ephemerella	20	8	6	14	20
Baetis	1	-	-	1	2
Tricorythodes	2	4	2	2	2
Caenis	-	-	-	-	-
Rhithrogena	-	-	-	-	-
Heptagenia	2	-	2	-	1
Heptageniidae	2	1	1	-	-
Ephemeridae	-	-	-	-	-
Undetermined Nymphules	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	61	11	11	14	55
Cheumatopsyche	-	-	1	-	1
Hydropsychidae	-	-	-	-	-
Glossosoma	3	1	1	-	-
Brachycentrus	-	-	-	-	-
Oecetis	-	-	-	-	-
Triaenodes	-	-	-	-	-
Psychomyia	1	1	-	1	-
Lepidostoma	-	-	-	-	-
Neureclipsis	-	-	-	-	-
Onocosmoecus	-	-	-	-	-
Hydroptila	-	-	-	-	-
Ceraclea	-	-	-	-	-
Leptoceridae	-	-	-	-	-

SITE: Fort Saskatchewan Right Bank
DATE: 20/05/82 Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
PLECOPTERA					
Isoperla	15	12	4	10	20
Alloperla	7	3	4	3	6
Isogenus	-	-	-	-	1
Pteronarcys	-	-	-	-	-
Taenionema	-	-	-	-	-
undetermined Plecoptera	-	-	-	-	-
COLLEMBOLA	-	1	-	-	-
LEPIDOPTERA	-	-	-	-	-
ODONATA	-	-	-	-	-
HEMIPTERA	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	44	92	72	72	52
Tanytarsini	4	-	-	12	12
Orthocladiinae	696	1008	596	952	792
Tanypodinae	8	12	8	16	20
Pupae/Adults	-	-	-	12	12
Ceratopogonidae	-	-	-	-	-
Tipulidae	-	-	-	-	-
Simuliidae	-	-	-	-	-
Rhagionidae	-	-	-	-	-
Culicidae	-	-	-	-	-
Tanyderidae	-	-	-	-	-
Empididae	-	-	-	-	-
COLEOPTERA					
Adults undetermined	-	3	-	-	-
Elmidae Larvae	-	-	1	-	-
Elmidae Adults	-	-	-	-	-
ACARI	8	1	2	-	4
MOLLUSCA					
Physidae	-	-	-	-	-
Lymnaeidae	-	-	-	-	-
Planorbidae	-	-	-	-	-
Ancylidae					
Ferrissia	-	-	1	-	2
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-

RIVER: North Saskatchewan River
SITE: Sturgeon Left Bank
DATE: 20/05/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
Undetermined	36	24	12	8	8
Mermithoidea	16	12	4	20	36
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	320	1524	1464	372	116
Naididae	240	32	88	12	88
Enchytraeidae	-	-	-	-	-
HIRUDINEA	-	-	-	2	-
CRUSTACEA					
Amphipoda					
Hyalella	8	3	3	5	38
Gammarus	2	-	1	1	-
EPHEMEROPTERA					
Ephemerella	1	-	1	5	7
Baetis	-	-	-	1	-
Tricorythodes	3	-	2	4	28
Caenis	4	-	1	-	7
Rhithrogena	-	-	-	-	-
Heptagenia	-	-	-	-	-
Heptageniidae	-	-	-	-	-
Ephemeridae	-	1	-	-	-
Undetermined Nymphules	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	-	-	-	1	3
Cheumatopsyche	-	-	-	-	1
Hydropsychidae	-	-	-	-	-
Glossosoma	-	-	-	-	-
Brachycentrus	-	-	-	-	-
Oecetis	-	-	1	-	-
Triaenodes	-	-	-	-	-
Psychomyia	-	-	-	-	-
Lepidostoma	-	-	-	-	-
Neureclipsis	-	-	-	-	-
Onocosmoecus	-	-	-	-	-
Hydroptila	-	-	-	-	-
Ceraclea	-	-	-	-	-
Leptoceridae	-	-	-	-	-

SITE: **Sturgeon Left Bank**
DATE: 20/05/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
PLECOPTERA					
Isoperla	1	2	-	2	1
Alloperla	-	-	-	-	-
Isogenus	-	-	-	-	-
Pteronarcys	-	-	-	-	-
Taenionema	-	-	-	-	-
Undetermined Plecoptera	-	-	-	-	-
COLLEMBOLA	1	-	-	-	-
LEPIDOPTERA	1	1	-	-	2
ODONATA	-	-	-	-	1
HEMIPTERA	2	1	1	-	3
DIPTERA					
Chironomidae					
Chironomini	68	64	52	16	140
Tanytarsini	4	-	-	8	444
Orthocladiinae	4	20	28	16	28
Tanypodinae	28	16	4	4	28
Pupae/Adults	-	-	-	4	-
Ceratopogonidae	-	12	-	-	4
Tipulidae	-	-	-	-	-
Simuliidae	-	-	-	-	-
Rhagionidae	-	-	-	-	-
Culicidae	-	-	-	1	-
Tanyderidae	-	-	-	-	-
Empididae	-	-	-	-	1
COLEOPTERA					
Adults Undetermined	3	1	1	2	4
Elmidae Larvae	2	2	3	8	6
Elmidae Adults	-	-	-	-	-
ACARI	1	-	-	2	2
MOLLUSCA					
Physidae	-	-	1	-	-
Lymnaeidae	-	-	-	-	-
Planorbidae	-	-	-	-	-
Ancylidae					
Ferrissia	6	-	3	6	5
Sphaeriidae					
Pisidium	2	-	2	1	5
Sphaerium	1	-	-	-	-

RIVER: North Saskatchewan River
SITE: Sturgeon Right Bank
DATE: 20/05/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
Undetermined	4	40	56	-	36
Mermithoidea	-	12	8	4	16
TURBELLARIA	4	-	-	-	-
OLIGOCHAETA					
Tubificidae	384	284	580	252	984
Naididae	1184	888	2576	708	1940
Enchytraeidae	-	-	-	4	-
HIRUDINEA	-	1	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Gammarus	-	-	-	-	2
EPHEMEROPTERA					
Ephemerella	2	2	1	-	-
Baetis	-	-	-	-	-
Tricorythodes	-	-	-	-	-
Caenis	-	-	-	-	-
Rhithrogena	-	-	-	-	-
Heptagenia	-	-	-	-	2
Heptageniidae	-	1	-	-	-
Ephemeridae	-	-	-	-	-
Undetermined Nymphules	-	-	-	-	1
TRICHOPTERA					
Hydropsyche	-	-	-	-	1
Cheumatopsyche	-	-	-	-	-
Hydropsychidae	-	-	-	-	-
Glossosoma	-	-	-	-	-
Brachycentrus	-	-	-	-	-
Oecetis	-	-	-	-	-
Triaenodes	-	-	-	-	-
Psychomyia	-	-	-	1	-
Lepidostoma	-	-	-	-	-
Neureclipsis	-	-	-	-	-
Onocosmoecus	-	-	-	-	-
Hydroptila	-	-	-	-	-
Ceraclea	-	-	-	-	-
Leptoceridae	-	-	-	-	-

SITE: **Sturgeon Right Bank**
DATE: 20/05/82 Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
PLECOPTERA					
Isoperla	1	2	-	-	11
Alloperla	-	1	-	-	-
Isogenus	-	-	-	-	-
Pteronarcys	-	-	-	-	-
Taenionema	-	-	-	-	-
undetermined Plecoptera	-	-	-	-	-
COLLEMBOLA	-	-	1	-	1
LEPIDOPTERA	-	-	-	-	-
ODONATA	-	-	-	-	-
HEMIPTERA	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	120	48	120	132	252
Tanytarsini	4	-	-	-	8
Orthocladiinae	260	480	92	76	568
Tanypodinae	-	4	4	-	8
Pupae/Adults	-	-	4	-	12
Ceratopogonidae	1	-	-	-	-
Tipulidae	-	-	-	-	-
Simuliidae	-	-	-	-	-
Rhagionidae	-	-	-	-	-
Culicidae	-	-	-	-	-
Tanyderidae	-	-	-	-	-
Empididae	-	-	-	-	-
COLEOPTERA					
Adults undetermined	-	-	1	1	1
Elmidae Larvae	-	-	-	-	-
Elmidae Adults	-	-	-	-	-
ACARI	-	-	-	8	-
MOLLUSCA					
Physidae	-	-	-	-	-
Lymnaeidae	-	-	-	-	-
Planorbidae	-	-	-	-	-
Ancylidae					
Ferrissia	4	24	-	-	3
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-

RIVER: North Saskatchewan River
SITE: Vinca Bridge Left Bank
DATE: 28/05/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
undetermined	40	149	164	196	204
Mermithcidea	41	75	36	96	76
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	217	669	264	252	280
Naididae	158	658	356	800	424
Enchytraeidae	-	-	-	-	-
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	1	-	-	-
Gammarus	-	-	-	4	-
EPHEMEROPTERA					
Ephemerella	10	14	28	32	-
Baetis	-	-	-	-	-
Tricorythodes	33	38	40	32	44
Caenis	-	-	-	-	-
Rhithrogena	-	-	-	-	-
Heptagenia	1	2	8	-	-
Heptageniidae	-	-	-	-	-
Ephemeridae	-	-	-	-	-
Undetermined Nymphules	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	6	9	8	8	-
Cheumatopsyche	-	-	-	-	-
Hydropsychidae	-	1	4	4	-
Glossosoma	-	1	4	-	-
Brachycentrus	-	-	-	-	-
Oecetis	-	2	-	-	-
Triaenodes	1	-	-	-	-
Psychomyia	4	5	12	8	4
Lepidostoma	-	-	-	-	-
Neureclipsis	-	-	-	-	-
Onocosmoecus	-	-	-	-	-
Hydroptila	-	-	-	-	-
Ceraclea	-	-	-	-	-
Leptoceridae	-	-	-	-	-

SITE: Vinca Bridge Left Bank
DATE: 28/05/82 Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
PLECOPTERA					
Isoperla	2	2	4	12	4
Alloperla	1	-	-	4	-
Isogenus	-	-	-	-	-
Pteronarcys	-	-	-	-	-
Taenionema	-	-	-	-	-
Undetermined Plecoptera	-	-	-	-	-
COLLEMBOLA	-	-	-	-	-
LEPIDOPTERA	-	-	-	-	-
ODONATA	-	-	-	-	-
HEMIPTERA	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	152	519	200	292	196
Tanytarsini	2	5	4	4	-
Orthocladiinae	96	206	180	152	248
Tanypodinae	30	49	36	32	32
Pupae/Adults	2	5	4	-	-
Ceratopogonidae	-	1	-	4	-
Tipulidae	-	-	-	-	-
Simuliidae	-	-	-	-	-
Rhagionidae	-	-	-	-	-
Culicidae	-	-	-	-	-
Tanyderidae	-	-	-	-	-
Empididae	1	1	-	8	-
COLEOPTERA					
Adults Undetermined	-	-	-	-	-
Elmidae Larvae	1	3	-	4	-
Elmidae Adults	-	-	-	-	-
ACARI	2	2	-	8	-
MOLLUSCA					
Physidae	-	2	-	-	-
Lymnaeidae	-	-	-	-	-
Planorbidae	-	-	-	-	-
Ancylidae					
Ferrissia	1	1	-	4	4
Sphaeriidae					
Pisidium	2	1	-	-	-
Sphaerium	1	-	-	-	-

RIVER: North Saskatchewan River
SITE: Vinca Bridge Right Bank
DATE: 28/05/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
undetermined	8	8	12	8	-
Mermithoidea	148	48	52	72	-
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	224	336	228	460	80
Naididae	44	184	64	208	88
Enchytraeidae	-	-	-	-	-
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Gammarus	-	-	-	-	-
EPHEMEROPTERA					
Ephemerella	28	26	20	11	20
Baetis	4	-	-	-	-
Tricorythodes	20	24	20	16	16
Caenis	-	-	-	-	-
Rhithrogena	-	-	-	-	-
Heptagenia	8	-	-	4	4
Heptageniidae	-	-	-	-	-
Ephemeridae	-	-	-	-	-
undetermined Nymphules	4	-	-	12	-
TRICHOPTERA					
Hydropsyche	236	36	82	100	192
Cheumatopsyche	4	4	-	-	-
Hydropsychidae	-	-	-	-	-
Glossosoma	-	-	-	-	4
Brachycentrus	-	-	-	-	-
Oecetis	-	-	-	-	4
Triaenodes	-	-	-	-	-
Psychomyia	8	-	4	4	-
Lepidostoma	-	-	-	-	-
Neureclipsis	-	-	-	-	-
Onocosmoecus	-	-	-	-	-
Hydroptila	-	-	-	-	-
Ceraclea	-	-	-	-	-
Leptoceridae	-	-	-	-	-

SITE: **Vinca Bridge Right Bank**
DATE: 28/05/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
PLECOPTERA					
Isoperla	12	16	12	12	4
Alloperla	4	-	4	-	-
Isogenus	-	-	-	-	-
Pteronarcys	-	-	-	-	-
Taenionema	-	-	-	-	-
Undetermined Plecoptera	-	-	-	-	-
COLLEMBOLA	-	-	-	-	-
LEPIDOPTERA	-	-	-	-	-
ODONATA	-	-	-	-	-
HEMIPTERA	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	100	176	80	204	88
Tanytarsini	-	-	8	4	-
Orthocladiinae	436	362	300	284	476
Tanypodinae	124	36	108	72	72
Pupae/Adults	12	16	20	44	8
Ceratopogonidae	-	-	-	-	-
Tipulidae	-	-	-	-	-
Simuliidae	-	-	-	-	-
Rhagionidae	-	-	-	-	-
Culicidae	-	-	-	-	-
Tanyderidae	-	-	-	-	-
Empididae	1	-	-	-	-
COLEOPTERA					
Adults Undetermined	-	-	-	-	-
Elmidae Larvae	-	-	-	-	-
Elmidae Adults	-	-	-	-	-
ACARI	12	-	8	-	-
MOLLUSCA					
Physidae	-	-	-	-	-
Lymnaeidae	-	-	-	-	-
Planorbidae	-	-	-	-	-
Ancylidae					
Ferrissia	-	-	-	12	-
Sphaeriidae					
Pisidium	-	-	4	-	-
Sphaerium	4	-	-	-	-

RIVER: North Saskatchewan River
SITE: Pakan Left Bank
DATE: 28/05/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
Undetermined	11	13	11	21	24
Mermithoidea	4	12	8	5	5
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	14	61	23	26	84
Naididae	9	4	21	12	24
Enchytraeidae	-	-	-	-	-
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	1
Gammarus	-	-	-	-	-
EPHEMEROPTERA					
Ephemerella	17	9	24	21	31
Baetis	9	4	3	11	9
Tricorythodes	15	22	27	39	41
Caenis	-	-	-	-	-
Rhithrogena	-	-	-	-	-
Heptagenia	-	-	-	-	4
Heptageniidae	1	3	-	3	2
Ephemeridae	-	-	-	-	-
Undetermined Nymphules	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	2	4	9	45	55
Cheumatopsyche	4	2	2	7	8
Hydropsychidae	1	3	-	1	1
Glossosoma	1	3	-	3	3
Brachycentrus	-	-	-	-	-
Oecetis	-	-	-	-	-
Triaenodes	-	-	-	-	-
Psychomyia	-	-	1	2	5
Lepidostoma	-	-	-	-	-
Neureclipsis	1	-	-	-	1
Onocosmoecus	-	-	-	-	-
Hydroptila	-	-	-	-	-
Ceraclea	-	-	-	-	-
Leptoceridae	-	-	-	-	1

SITE: **Pakan Left Bank**
DATE: 28/05/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
PLECOPTERA					
Isoperla	8	-	6	8	45
Alloperla	-	-	1	3	9
Isogenus	-	-	-	-	-
Pteronarcys	-	-	1	-	-
Taenionema	-	-	-	-	-
Undetermined Plecoptera	-	1	-	-	-
COLLEMBOLA	-	-	-	-	-
LEPIDOPTERA	-	-	-	-	-
ODONATA	-	-	-	2	-
HEMIPTERA	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	61	41	73	68	120
Tanytarsini	1	1	1	1	8
Orthocladiinae	64	46	29	156	184
Tanypodinae	9	2	4	20	24
Pupae/Adults	3	5	4	4	8
Ceratopogonidae	2	-	1	1	-
Tipulidae	-	-	-	-	-
Simuliidae	-	-	-	-	-
Rhagionidae	-	-	-	-	-
Culicidae	-	-	-	-	-
Tanyderidae	-	-	-	-	-
Empididae	-	-	-	1	1
COLEOPTERA					
Adults Undetermined	-	-	-	-	-
Elmidae Larvae	-	-	-	2	1
Elmidae Adults	-	-	-	-	-
ACARI	5	2	5	4	5
MOLLUSCA					
Physidae	-	-	-	-	-
Lymnaeidae	-	-	-	-	-
Planorbidae	-	-	-	-	-
Ancylidae					
Ferrissia	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	1
Sphaerium	-	-	-	-	-

RIVER: North Saskatchewan River
SITE: Pakan Right Bank
DATE: 28/05/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	1	-	1
NEMATODA					
Undetermined	12	40	4	4	1
Mermithoidea	4	16	20	8	1
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	48	1080	112	323	26
Naididae	16	160	8	10	1
Enchytraeidae	-	-	-	-	-
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	1	-
Gammarus	-	-	-	-	-
EPHEMEROPTERA					
Ephemerella	20	24	12	2	2
Baetis	-	4	-	1	1
Tricorythodes	8	24	1	3	2
Caenis	-	-	-	-	-
Rhithrogena	-	-	-	-	-
Heptagenia	-	-	3	2	6
Heptageniidae	-	-	-	-	-
Ephemeridae	-	-	-	-	-
Undetermined Nymphules	16	28	9	4	4
TRICHOPTERA					
Hydropsyche	52	20	13	5	68
Cheumatopsyche	-	8	1	-	2
Hydropsychidae	16	24	12	9	17
Glossosoma	4	-	2	-	13
Brachycentrus	-	-	-	-	-
Oecetis	-	-	-	-	-
Triaenodes	-	-	-	-	-
Psychomyia	-	-	4	1	2
Lepidostoma	-	-	-	-	-
Neureclipsis	-	-	-	-	-
Onocosmoecus	-	-	-	-	-
Hydroptila	-	-	-	-	-
Ceraclea	-	-	-	-	-
Leptoceridae	-	-	-	-	-

SITE: **Pakan Right Bank**
DATE: 28/05/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
PLECOPTERA					
Isoperla	32	12	96	3	9
Alloperla	-	-	-	-	1
Isogenus	-	-	-	-	-
Pteronarcys	-	-	-	-	-
Taenionema	-	-	-	-	-
Undetermined Plecoptera	-	-	-	-	-
COLLEMBOLA	-	-	-	-	-
LEPIDOPTERA	-	-	-	-	-
ODONATA	-	-	-	-	-
HEMIPTERA	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	28	280	8	20	6
Tanytarsini	-	4	-	1	-
Orthocladiinae	416	584	260	272	74
Tanypodinae	24	56	24	11	8
Pupae/Adults	8	40	36	20	5
Ceratopogonidae	-	8	-	1	-
Tipulidae	-	-	-	-	-
Simuliidae	-	-	-	-	-
Rhagionidae	-	-	-	-	-
Culicidae	-	-	-	-	-
Tanyderidae	-	-	-	-	-
Empididae	-	-	-	-	1
COLEOPTERA					
Adults Undetermined	-	4	-	-	1
Elmidae Larvae	4	-	-	1	1
Elmidae Adults	-	-	-	-	-
ACARI	4	8	4	1	-
MOLLUSCA					
Physidae	-	-	-	-	-
Lymnaeidae	-	-	-	-	-
Planorbidae	-	-	-	-	-
Ancylidae					
Ferrissia	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	2	-	1
Sphaerium	-	-	-	-	1

RIVER: North Saskatchewan River
SITE: Devon Left Bank
DATE: 10/08/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
Undetermined	4	4	-	1	1
Mermithoidea	2	2	-	-	-
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	-	-	1	2	-
Naididae	1	5	8	13	7
Enchytraeidae	15	13	23	37	14
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Ephemeroptera					
Ephemerella	2	-	-	-	-
Baetis	-	-	-	-	-
Tricorythodes	-	-	-	-	1
Caenis	-	-	-	-	-
Rhithrogena	-	-	-	-	-
Heptagenia	-	1	-	-	-
Heptageniidae	-	4	6	3	9
Ephemera	-	-	-	-	-
Ephemeridae	-	-	-	-	-
Pseudocloeon	-	-	-	-	-
Paraleptophlebia	-	-	-	-	-
Centroptilum	-	-	-	-	-
Stenonema (Terminatum?)	-	-	-	-	-
Undetermined Nymphules	1	2	1	2	1
Adults	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	-	-	-	1	-
Cheumatopsyche	-	-	-	-	-
Arctopsyche	-	-	-	-	-
Hydropsychidae	2	1	3	6	1
Glossosoma	-	1	2	-	1
Brachycentrus	-	-	1	2	1
Oecetis	-	-	-	-	-
Ceraclea	-	-	1	2	-
Leptoceridae	-	-	-	-	-
Hydroptila	-	-	-	-	-
Neotrichia	-	-	-	-	-

SITE: **Devon Left Bank**
DATE: 10/08/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Mayatrichia	-	-	-	-	-
Psychomyia	-	-	-	-	-
Adults	-	-	-	-	-
PLECOPTERA					
Isogenus	-	-	-	-	-
Acroneuria	-	-	-	-	-
Perlidae	-	-	-	-	-
Perlodidae	-	1	-	-	-
undetermined	7	5	3	4	5
COLLEMBOLA	1	-	-	-	-
ODONATA					
Ophiogomphus	-	-	-	-	-
HEMIPTERA					
Corixidae	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	1	-	2	5	3
Tanytarsini	-	-	1	-	-
Orthocladiinae	8	5	7	5	10
Tanypodinae	-	-	-	-	-
Pupae	-	4	3	6	6
Ceratopogonidae	20	17	19	6	16
Tipulidae	1	-	-	-	2
Chaoboridae					
Chaoborus	-	-	-	-	-
Dolichopodidae	-	-	-	-	-
Empididae	-	1	-	1	-
Simuliidae	-	-	-	-	-
Adults	-	-	4	-	-
COLEOPTERA					
Dytiscidae	-	-	-	-	-
Haliplidae	-	-	-	-	-
Elmidae	-	-	-	-	-
ACARI	-	2	-	2	2
MOLLUSCA					
Physidae	-	-	-	-	-
Lymnaeidae	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-
Ancylidae					
Ferrissia	-	-	-	-	-

RIVER: North Saskatchewan River
SITE: Devon Right Bank
DATE: 10/08/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
Undetermined	1	10	2	14	10
Mermithoidea	5	3	2	5	8
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	1	5	2	7	5
Naididae	29	39	21	46	21
Enchytraeidae	19	14	9	32	30
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Ephemeroptera					
Ephemerella	-	1	1	1	1
Baetis	-	-	1	-	1
Tricorythodes	-	1	-	-	1
Caenis	-	-	-	-	-
Rhithrogena	2	-	1	1	1
Heptagenia	2	1	1	-	-
Heptageniidae	5	7	9	11	9
Ephemera	-	-	-	-	-
Ephemeridae	-	-	1	-	-
Pseudocloeon	-	-	-	-	1
Paraleptophlebia	-	-	-	-	-
Centroptilum	-	-	-	-	-
Stenonema (Terminatum?)	-	-	-	-	-
Undetermined Nymphules	4	2	2	5	2
Adults	-	-	-	-	-
TRICHOPTERA					
Hvdropsyche	3	5	5	5	-
Cheumatopsyche	-	-	-	-	-
Arctopsyche	1	-	-	1	-
Hydropsychidae	8	7	19	13	15
Glossosoma	-	1	-	-	-
Brachycentrus	-	-	-	-	-
Oecetis	-	-	-	-	1
Ceraclea	-	-	-	-	-
Leptoceridae	16	12	11	38	29
Hydroptila	-	-	-	-	-
Neotrichia	2	1	-	1	-

SITE: **Devon Right Bank**
DATE: 10/08/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Mayatrichia	-	-	-	-	-
Psychomyia	-	-	-	-	1
Adults	-	-	-	-	-
PLECOPTERA					
Isogenus	-	-	-	-	-
Acroneuria	-	-	-	-	-
Perlidae	-	-	-	-	-
Perlodidae	-	-	1	-	-
Undetermined	11	16	7	16	21
COLLEMBOLA	-	-	-	-	-
ODONATA					
Ophiogomphus	-	-	-	-	-
HEMIPTERA					
Corixidae	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	7	17	4	2	24
Tanytarsini	5	11	6	6	7
Orthocladiinae	2	-	-	-	2
Tanypodinae	1	1	2	1	1
Pupae	-	-	-	-	-
Ceratopogonidae	-	-	-	-	-
Tipulidae	1	-	-	-	-
Chaoboridae					
Chaoborus	-	-	-	-	-
Dolichopodidae	-	-	1	-	-
Empididae	-	-	-	-	-
Simuliidae	-	-	-	-	-
Adults	2	3	4	3	5
COLEOPTERA					
Dytiscidae	-	-	-	-	-
Haliplidae	-	-	-	-	-
Elmidae	-	-	-	-	-
ACARI	3	-	1	4	1
MOLLUSCA					
Physidae	-	-	-	-	-
Lymnaeidae	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-
Ancylidae					
Ferrissia	-	-	-	-	-

RIVER: North Saskatchewan River
SITE: E.L. Smith Left Bank
DATE: 10/8/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	1	-	-
NEMATODA					
undetermined	5	9	3	4	7
Mermithoidea	-	5	-	5	4
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	4	1	-	-	-
Naididae	36	14	7	1	2
Enchytraeidae	26	20	12	12	9
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Ephemeroptera					
Ephemerella	-	-	-	-	-
Baetis	-	-	-	-	-
Tricorythodes	-	-	-	-	-
Caenis	-	-	-	-	-
Rhithrogena	-	-	-	-	-
Heptagenia	-	-	-	-	-
Heptageniidae	-	1	-	-	-
Ephemera	-	-	-	-	-
Ephemeridae	-	-	-	-	-
Pseudocloeon	-	-	-	-	
Paraleptophlebia	-	-	-	-	-
Centroptilum	-	-	-	-	-
Stenonema (Terminatum?)	-	-	-	-	-
undetermined Nymphules	3	2	1	3	3
Adults	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	-	-	-	-	-
Cheumatopsyche	-	-	-	-	-
Arctopsyche	-	-	-	-	-
Hydropsychidae	34	-	-	1	1
Glossosoma	-	-	-	-	1
Brachycentrus	1	2	-	-	2
Oecetis	-	1	1	-	-
Ceraclea	-	-	-	-	-
Leptoceridae	-	-	-	-	-
Hydroptila	-	-	-	-	-
Neotrichia	-	-	-	-	-

SITE: E.L. Smith Left Bank
DATE: 10/8/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Mayatrichia	-	-	-	-	-
Psychomyia	-	-	-	-	-
Adults	-	-	-	-	-
PLECOPTERA					
Isogenus	-	-	-	-	-
Acroneuria	-	-	-	-	-
Perlidae	-	-	-	-	-
Perlodidae	-	-	-	-	-
undetermined	2	1	-	2	3
COLLEMBOLA	-	-	-	-	-
ODONATA					
Ophiogomphus	-	-	-	-	-
HEMIPTERA					
Corixidae	1	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	21	8	11	14	8
Tanytarsini	1	4	-	6	7
Orthocladiinae	11	4	5	10	9
Tanypodinae	-	-	-	-	-
Pupae	1	-	-	1	1
Ceratopogonidae	1	-	-	2	1
Tipulidae	-	-	1	-	-
Chaoboridae					
Chaoborus	-	-	-	-	-
Dolichopodidae	-	-	-	-	-
Empididae	-	1	-	-	1
Simuliidae	-	-	-	-	-
Adults	-	-	-	-	-
COLEOPTERA					
Dytiscidae	-	-	-	-	-
Haliplidae	1	-	-	-	-
Elmidae	-	-	-	-	-
ACARI	1	1	1	-	1
MOLLUSCA					
Physidae	-	-	-	-	-
Lymnaeidae	-	-	-	-	-
Sphaeriidae	-	-	-	-	-
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-
Ancylidae					
Ferrissia	-	-	-	-	-

RIVER: North Saskatchewan River
SITE: E.L. Smith Right Bank
DATE: 10/08/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
Undetermined	6	18	1	2	9
Mermithoidea	2	3	5	1	1
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	8	13	4	12	14
Naididae	10	9	8	1	11
Enchytraeidae	10	9	6	8	27
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Ephemeroptera					
Ephemerella	3	8	-	4	3
Baetis	1	4	-	-	-
Tricorythodes	2	2	1	1	1
Caenis	-	-	-	-	-
Rhithrogena	-	-	1	-	2
Heptagenia	-	4	1	-	-
Heptageniidae	13	8	9	-	10
Ephemera	-	-	-	-	-
Ephemeridae	-	-	-	-	-
Pseudocloeon	-	-	1	-	3
Paraleptophlebia	-	1	-	-	-
Centroptilum	-	-	-	-	-
Stenonema (Terminatum?)	-	-	-	-	-
Undetermined Nymphules	3	6	2	-	6
Adults	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	20	21	16	12	12
Cheumatopsyche	2	1	1	-	4
Arctopsyche	-	-	-	-	-
Hydropsychidae	14	15	17	8	23
Glossosoma	8	2	3	-	1
Brachycentrus	2	-	-	1	2
Oecetis	-	-	-	-	-
Ceraclea	-	-	-	-	-
Leptoceridae	1	2	1	1	7
Hydroptila	-	-	-	-	-
Neotrichia	2	1	-	2	-

SITE: E.L. Smith Right Bank
DATE: 10/8/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Mayatrichia	-	-	-	-	-
Psychomyia	-	-	1	-	1
Adults	-	1	-	-	-
PLECOPTERA					
Isogenus	-	1	-	-	-
Acroneuria	1	-	-	-	-
Perlidae	-	-	-	-	-
Perlodidae	-	-	-	-	-
Undetermined	14	21	9	6	15
COLLEMBOLA	-	-	-	-	-
ODONATA					
Ophiogomphus	-	-	-	-	-
HEMIPTERA					
Corixidae	1	1	-	1	-
DIPTERA					
Chironomidae					
Chironomini	2	2	1	3	11
Tanytarsini	26	21	12	11	17
Orthocladiinae	23	46	39	23	31
Tanypodinae	8	2	2	1	7
Pupae	3	4	-	1	1
Ceratopogonidae	-	1	1	-	1
Tipulidae	-	-	-	-	1
Chaoboridae					
Chaoborus	-	-	-	-	-
Dolichopodidae	-	-	-	-	-
Empididae	1	2	2	1	7
Simuliidae	-	-	-	-	-
Adults	2	4	9	6	5
COLEOPTERA					
Dytiscidae	-	-	-	-	-
Haliplidae	-	-	1	-	-
Elmidae	1	-	-	-	1
ACARI	9	14	15	8	13
MOLLUSCA					
Physidae	-	-	-	-	-
Lymnaeidae	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-
Ancylidae					
Ferrissia	2	-	2	1	2

RIVER: North Saskatchewan River
SITE: Rossdale Left Bank
DATE: 09/08/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	2	-	-	-	1
NEMATODA					
Undetermined	29	13	17	21	14
Mermithoidea	5	3	2	3	2
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	15	10	15	25	7
Naididae	41	12	15	12	1
Enchytraeidae	1	1	-	1	2
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Ephemeroptera					
Ephemerella	3	4	3	2	4
Baetis	1	3	2	1	2
Tricorythodes	1	2	2	1	-
Caenis	-	-	-	-	-
Rhithrogena	12	20	23	7	3
Heptagenia	-	2	2	2	-
Heptageniidae	29	25	24	14	8
Ephemera	-	-	-	-	-
Ephemeridae	-	-	-	-	-
Pseudocloeon	-	-	1	-	-
Paraleptophlebia	-	-	-	-	-
Centroptilum	-	-	-	-	-
Stenonema (Terminatum?)	-	-	-	-	-
Undetermined Nymphules	7	6	7	3	4
Adults	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	5	2	7	4	8
Cheumatopsyche	2	1	1	1	-
Arctopsyche	-	-	1	1	-
Hydropsychidae	14	19	26	23	4
Glossosoma	3	9	6	9	3
Brachycentrus	-	-	-	-	-
Oecetis	-	-	-	-	-
Ceraclea	-	-	-	-	-
Leptoceridae	-	-	-	-	-
Hydroptila	-	-	-	-	-
Neotrichia	-	-	-	1	-

SITE: Rossdale Left Bank
DATE: 09/08/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Mayatrichia	-	-	-	-	-
Psychomyia	-	-	-	-	-
Adults	-	-	1	-	-
PLECOPTERA					
Isogenus	2	2	4	-	5
Acroneuria	-	-	1	-	-
Perlidae	-	-	-	-	-
Perlodidae	-	-	-	-	-
undetermined	35	21	31	15	13
COLLEMBOLA	1	-	-	-	-
ODONATA					
Ophiogomphus	-	-	-	-	-
HEMIPTERA					
Corixidae	-	-	-	-	1
DIPTERA					
Chironomidae					
Chironomini	8	4	10	14	7
Tanytarsini	14	10	10	5	3
Orthocladiinae	158	112	164	133	121
Tanypodinae	-	2	-	-	2
Pupae	8	1	2	5	2
Ceratopogonidae	1	-	-	1	-
Tipulidae	-	-	-	1	-
Chaoboridae					
Chaoborus	-	-	-	-	-
Dolichopodidae	-	-	-	-	-
Empididae	-	-	-	-	-
Simuliidae	-	-	-	1	-
Adults	11	1	10	3	11
COLEOPTERA					
Dytiscidae	-	-	-	-	-
Haliplidae	-	-	-	-	-
Elmidae	-	-	-	1	1
ACARI	5	7	1	2	2
MOLLUSCA					
Physidae	-	-	-	-	-
Lymnaeidae	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-
Ancylidae					
Ferrissia	-	-	1	-	2

RIVER: North Saskatchewan River
SITE: Rossdale Right Bank
DATE: 09/08/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
undetermined	46	13	14	17	16
Mermithoidea	-	7	3	4	6
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	62	1	3	3	14
Naididae	37	6	10	13	4
Enchytraeidae	3	1	1	1	-
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Ephemeroptera					
Ephemerella	-	-	-	1	-
Baetis	-	-	-	-	-
Tricorythodes	2	-	-	-	-
Caenis	-	-	-	-	-
Rhithrogena	-	-	-	-	-
Heptagenia	-	-	-	-	-
Heptageniidae	1	3	1	-	-
Ephemera	-	-	-	-	-
Ephemeridae	-	-	-	-	-
Pseudocloeon	-	-	-	-	-
Paraleptophlebia	-	-	-	-	-
Centroptilum	-	-	-	-	-
Stenonema (Terminatum?)	-	-	-	-	-
Undetermined Nymphules	5	1	1	-	-
Adults	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	-	-	-	-	-
Cheumatopsyche	-	-	-	-	-
Arctopsyche	-	-	-	-	-
Hydropsychidae	28	3	-	4	2
Glossosoma	-	-	-	-	-
Brachycentrus	-	-	2	-	-
Oecetis	-	-	-	-	-
Ceraclea	-	-	-	-	-
Leptoceridae	1	-	1	1	-
Hydroptila	-	-	-	-	-
Neotrichia	-	-	-	-	-

SITE: Rossdale Right Bank
DATE: 09/08/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Mayatrichia	-	-	-	-	-
Psychomyia	-	-	-	-	-
Adults	-	-	-	-	-
PLECOPTERA					
Isogenus	-	-	-	-	-
Acroneuria	-	-	-	-	-
Perlidae	-	-	-	-	-
Perlodidae	-	-	-	-	-
undetermined	1	-	3	-	2
COLLEMBOLA	-	-	1	-	-
ODONATA					
Ophiogomphus	-	-	-	-	-
HEMIPTERA					
Corixidae	-	-	1	-	-
DIPTERA					
Chironomidae					
Chironomini	107	2	8	14	8
Tanytarsini	3	1	1	-	-
Orthocladiinae	47	7	11	13	6
Tanypodinae	2	-	-	3	-
Pupae	7	-	1	-	-
Ceratopogonidae	-	-	1	-	-
Tipulidae	1	-	-	1	-
Chaoboridae					
Chaoborus	-	-	-	-	-
Dolichopodidae	-	-	-	-	-
Empididae	-	-	-	-	-
Simuliidae	-	1	-	-	-
Adults	3	-	1	1	1
COLEOPTERA					
Dytiscidae	-	-	-	-	-
Haliplidae	-	-	-	-	-
Elmidae	-	-	-	-	-
ACARI	1	-	1	2	-
MOLLUSCA					
Physidae	-	-	-	-	-
Lymnaeidae	-	-	-	-	-
Sphaeriidae	-	-	-	-	-
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-
Ancylidae					
Ferrissia	-	-	-	-	-

RIVER: North Saskatchewan River
SITE: 50th Street Left Bank
DATE: 10/08/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
Undetermined	47	57	12	21	13
Mermithoidea	4	10	7	6	3
TURBELLARIA	10	17	2	-	2
OLIGOCHAETA					
Tubificidae	42	25	68	7	10
Naididae	36	25	60	27	41
Enchytraeidae	1	4	4	2	6
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Ephemeroptera					
Ephemerella	-	-	1	1	-
Baetis	-	-	-	-	-
Tricorythodes	6	1	3	4	5
Caenis	-	-	-	-	-
Rhithrogena	1	-	-	-	-
Heptagenia	3	-	3	1	2
Heptageniidae	27	4	30	32	52
Ephemera	-	-	-	-	1
Ephemeridae	-	-	-	-	-
Pseudocloeon	-	-	1	-	2
Paraleptophlebia	-	-	-	-	-
Centroptilum	-	-	-	-	-
Stenonema (Terminatum?)	-	-	-	-	-
Undetermined Nymphules	11	1	3	8	32
Adults	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	12	10	16	9	38
Cheumatopsyche	1	-	1	-	-
Arctopsyche	-	-	-	-	2
Hydropsychidae	7	3	2	4	19
Glossosoma	6	4	11	5	6
Brachycentrus	-	-	-	1	2
Oecetis	-	-	-	-	-
Ceraclea	1	1	-	-	-
Leptoceridae	-	-	-	-	-
Hydroptila	-	-	-	-	1
Neotrichia	-	-	-	-	-

SITE: 50th Street Left Bank
DATE: 10/08/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Mayatrichia	-	-	-	-	-
Psychomyia	-	-	1	-	1
Adults	-	1	1	-	-
PLECOPTERA					
Isogenus	-	-	-	-	-
Acroneuria	-	-	-	-	-
Perlidae	-	-	-	-	-
Perlodidae	-	-	-	-	-
Undetermined	13	11	7	21	19
COLLEMBOLA	1	1	-	-	-
ODONATA					
Ophiogomphus	-	-	-	-	-
HEMIPTERA					
Corixidae	13	-	2	2	-
DIPTERA					
Chironomidae					
Chironomini	11	16	11	9	10
Tanytarsini	15	9	20	15	40
Orthocladiinae	91	106	99	81	108
Tanypodinae	-	-	1	3	12
Pupae	7	7	5	1	9
Ceratopogonidae	1	-	-	-	-
Tipulidae	-	-	1	-	-
Chaoboridae					
Chaoborus	-	-	-	-	-
Dolichopodidae	-	-	-	-	-
Empididae	-	-	1	1	1
Simuliidae	-	-	-	-	-
Adults	8	13	24	17	5
COLEOPTERA					
Dytiscidae	-	-	-	-	-
Haliplidae	-	-	-	-	-
Elmidae	-	-	1	-	-
ACARI	6	2	2	2	8
MOLLUSCA					
Physidae	-	-	-	-	-
Lymnaeidae	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	1
Sphaerium	-	-	-	-	-
Ancylidae					
Ferrissia	-	6	5	-	1

RIVER: North Saskatchewan River
SITE: 50th Street Right Bank
DATE: 10/08/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
Undetermined	50	75	36	40	48
Mermithoidea	19	6	21	13	21
TURBELLARIA	-	6	-	1	-
OLIGOCHAETA					
Tubificidae	36	81	17	27	14
Naididae	23	20	17	22	36
Enchytraeidae	1	4	4	2	6
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Ephemeroptera					
Ephemerella	-	-	-	3	-
Baetis	-	-	-	-	-
Tricorythodes	10	3	5	5	3
Caenis	-	-	1	1	-
Rhithrogena	-	-	-	-	-
Heptagenia	-	-	4	1	1
Heptageniidae	4	1	4	1	-
Ephemera	-	1	-	-	-
Ephemeridae	-	-	-	-	-
Pseudocloeon	-	-	-	-	-
Paraleptophlebia	-	-	-	-	-
Centroptilum	-	-	-	-	-
Stenonema (Terminatum?)	-	-	-	-	-
Undetermined Nymphules	23	6	18	11	12
Adults	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	13	6	7	8	11
Cheumatopsyche	3	-	-	1	-
Arctopsyche	-	-	-	-	1
Hydropsychidae	1	2	2	5	3
Glossosoma	3	3	7	1	1
Brachycentrus	2	1	-	1	-
Oecetis	-	-	-	-	-
Ceraclea	-	-	-	-	-
Leptoceridae	3	3	3	-	2
Hydroptila	4	2	-	3	3
Neotrichia	-	-	-	-	-

SITE: 50th Street Right Bank
DATE: 10/08/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Mayatrichia	-	-	-	-	-
Psychomyia	2	-	-	-	1
Adults	-	-	-	-	-
PLECOPTERA					
Isogenus	-	-	-	-	-
Acroneuria	-	-	-	-	-
Perlidae	-	-	-	-	-
Perlodidae	-	-	-	-	-
Undetermined	-	-	3	-	1
COLLEMBOLA	-	-	-	-	-
ODONATA					
Ophiogomphus	-	-	-	-	-
HEMIPTERA					
Corixidae	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	40	51	23	25	5
Tanytarsini	8	2	1	2	1
Orthocladiinae	137	106	110	92	90
Tanypodinae	2	2	-	1	1
Pupae	9	20	9	3	10
Ceratopogonidae	-	-	-	-	-
Tipulidae	-	-	-	-	-
Chaoboridae					
Chaoborus	-	-	-	-	-
Dolichopodidae	-	-	-	-	-
Empididae	7	4	5	1	4
Simuliidae	-	-	-	-	-
Adults	-	-	-	-	-
COLEOPTERA					
Dytiscidae	1	-	-	-	-
Haliplidae	-	-	-	-	-
Elmidae	-	-	-	-	-
ACARI	7	2	3	2	6
MOLLUSCA					
Physidae	-	-	-	-	-
Lymnaeidae	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-
Ancylidae					
Ferrissia	4	5	-	1	-

RIVER: North Saskatchewan River Sorted By: B. Wright
SITE: Rundle Footbridge Left Bank Counts and Identification: A. M. Anderson
DATE: 09/08/82

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
undetermined	50	31	32	23	21
Mermithoidea	15	20	9	3	8
TURBELLARIA	-	-	1	-	-
OLIGOCHAETA					
Tubificidae	124	39	49	68	34
Naididae	18	15	84	17	13
Enchytraeidae	5	2	3	1	1
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Ephemeroptera					
Ephemerella	1	2	2	-	1
Baetis	-	1	-	-	-
Tricorythodes	2	5	4	8	4
Caenis	-	-	-	-	-
Rhithrogena	2	10	-	1	11
Heptagenia	6	9	3	1	7
Heptageniidae	17	41	7	16	36
Ephemera	-	-	-	-	-
Ephemeridae	-	-	-	-	-
Pseudocloeon	-	-	-	2	1
Paraleptophlebia	-	-	-	-	-
Centroptilum	-	-	-	-	-
Stenonema (Terminatum?)	-	-	-	-	-
undetermined Nymphules	9	11	27	5	13
Adults	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	9	6	5	16	14
Cheumatopsyche	1	-	-	1	-
Arctopsyche	-	-	-	-	-
Hydropsychidae	13	29	5	19	63
Glossosoma	2	10	1	2	5
Brachycentrus	-	-	2	1	-
Oecetis	-	-	-	-	-
Ceraclea	-	-	-	-	-
Leptoceridae	-	-	1	-	-
Hydroptila	-	1	-	2	1
Neotrichia	-	1	-	-	1

SITE: Rundle Footbridge Left Bank
DATE: 09/08/82 Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Mayatrichia	-	-	-	-	-
Psychomyia	1	-	1	1	1
Adults	-	-	-	-	-
PLECOPTERA					
Isogenus	-	3	-	-	6
Acroneuria	-	-	-	-	-
Perlidae	-	-	-	-	-
Perlodidae	-	-	-	-	-
undetermined	11	14	8	8	28
COLLEMBOLA	-	-	-	-	-
ODONATA					
Ophiogomphus	-	-	-	-	-
HEMIPTERA					
Corixidae	-	-	-	5	-
DIPTERA					
Chironomidae					
Chironomini	20	5	11	7	6
Tanytarsini	8	13	9	10	21
Orthocladiinae	72	52	75	138	100
Tanypodinae	4	2	1	2	2
Pupae	2	2	4	2	3
Ceratopogonidae	1	-	-	-	-
Tipulidae	-	-	-	-	-
Chaoboridae					
Chaoborus	-	-	-	-	-
Dolichopodidae	-	-	-	-	-
Empididae	1	2	-	-	1
Simuliidae	-	-	-	-	-
Adults	1	2	7	9	6
COLEOPTERA					
Dytiscidae	-	-	-	-	-
Haliplidae	-	-	-	-	-
Elmidae	-	-	-	-	-
ACARI	2	11	5	10	21
MOLLUSCA					
Physidae	-	-	-	-	-
Lymnaeidae	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-
Ancylidae					
Ferrissia	-	3	-	2	5

RIVER: North Saskatchewan River Sorted By: B. Wright
SITE: Rundle Footbridge Right Bank Counts and Identification: A. M. Anderson
DATE: 09/08/82

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
undetermined	2	4	-	4	-
Mermithoidea	-	8	4	4	-
TURBELLARIA	2	4	-	-	-
OLIGOCHAETA					
Tubificidae	36	76	48	60	132
Naididae	858	1644	572	288	832
Enchytraeidae	-	4	-	8	-
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Ephemeroptera					
Ephemerella	6	4	8	-	4
Baetis	7	16	4	12	8
Tricorythodes	1	-	-	-	4
Caenis	-	-	-	-	-
Rhithrogena	9	-	12	4	-
Heptagenia	14	8	-	-	16
Heptageniidae	-	-	-	-	-
Ephemera	-	-	-	-	-
Ephemeridae	-	-	-	-	-
Pseudocloeon	-	8	4	4	4
Paraleptophlebia	-	-	-	-	-
Centroptilum	-	-	-	-	-
Stenonema (Terminatum?)	-	-	-	-	-
undetermined Nymphules	4	-	8	4	4
Adults	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	13	44	4	-	12
Cheumatopsyche	1	-	-	-	-
Arctopsyche	-	-	1	-	-
Hydropsychidae	8	64	8	8	48
Glossosoma	2	8	8	-	4
Brachycentrus	5	-	-	-	-
Oecetis	-	-	-	-	-
Ceraclea	-	-	-	-	-
Leptoceridae	-	-	-	-	-
Hydroptila	1	-	-	-	-
Neotrichia	-	-	-	-	-

SITE: Rundle Footbridge Right Bank
DATE: 09/08/82 Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Mayatrichia	-	-	-	-	-
Psychomyia	-	-	-	-	-
Adults	-	-	-	-	-
PLECOPTERA					
Isogenus	-	-	1	-	-
Acroneuria	-	-	-	-	-
Perlidae	-	-	-	-	-
Perlodidae	-	-	-	-	-
Undetermined	11	24	32	8	24
COLLEMBOLA	-	-	-	-	-
ODONATA					
Ophiogomphus	-	-	-	-	-
HEMIPTERA					
Corixidae	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	39	120	12	4	44
Tanytarsini	5	-	8	8	4
Orthocladiinae	170	224	180	144	180
Tanypodinae	2	4	-	-	4
Pupae	11	12	20	-	8
Ceratopogonidae	-	-	-	-	-
Tipulidae	-	-	-	-	-
Chaoboridae					
Chaoborus	-	-	-	-	-
Dolichopodidae	-	-	-	-	-
Empididae	-	-	-	-	-
Simuliidae	-	-	-	-	-
Adults	1	-	-	-	-
COLEOPTERA					
Dytiscidae	-	-	-	-	-
Haliplidae	-	-	-	-	-
Elmidae	-	-	-	-	-
ACARI	-	-	-	-	4
MOLLUSCA					
Physidae	-	-	-	-	-
Lymnaeidae	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-
Ancylidae					
Ferrissia	-	-	-	-	-

RIVER: North Saskatchewan River
SITE: Beverly Bridge Left Bank
DATE: 09/08/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
undetermined	228	416	364	332	740
Mermithoidea	-	-	8	-	-
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	80	140	72	120	216
Naididae	80	36	24	16	28
Enchytraeidae	12	-	-	-	-
HIRUDINEA	1	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Ephemeroptera					
Ephemerella	1	-	-	-	-
Baetis	-	-	-	-	-
Tricorythodes	7	7	1	7	1
Caenis	-	-	-	1	-
Rhithrogena	-	-	-	-	-
Heptagenia	-	-	-	-	1
Heptageniidae	3	2	1	-	1
Ephemera	-	-	-	-	-
Ephemeridae	-	-	1	-	-
Pseudocloeon	-	-	-	-	-
Paraleptophlebia	-	-	-	-	-
Centroptilum	-	-	-	-	-
Stenonema (Terminatum?)	-	-	-	-	-
undetermined Nymphules	1	8	2	11	1
Adults	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	4	-	-	3	-
Cheumatopsyche	1	-	-	-	-
Arctopsyche	-	-	-	-	-
Hydropsychidae	-	3	-	-	-
Glossosoma	-	1	-	1	-
Brachycentrus	1	-	-	-	-
Oecetis	-	-	-	-	-
Ceraclea	-	-	-	-	-
Leptoceridae	3	1	1	4	-
Hydroptila	-	-	-	-	-
Neotrichia	-	-	-	-	-

SITE: Beverly Bridge Left Bank
DATE: 09/08/82 Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Mayatrichia	-	-	-	-	-
Psychomyia	-	-	-	-	-
Adults	-	-	-	-	-
PLECOPTERA					
Isogenus	-	-	-	-	-
Acroneuria	-	-	-	-	-
Perlidae	-	-	-	1	-
Perlodidae	-	-	-	-	-
undetermined	1	5	-	1	-
COLLEMBOLA	-	-	-	-	-
ODONATA					
Ophiogomphus	-	-	-	-	1
HEMIPTERA					
Corixidae	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	112	164	108	112	128
Tanytarsini	4	16	4	-	-
Orthocladiinae	116	128	64	76	76
Tanypodinae	-	4	-	-	-
Pupae	12	24	12	8	12
Ceratopogonidae	-	-	1	-	-
Tipulidae	-	-	-	-	-
Chaoboridae					
Chaoborus	-	-	-	-	-
Dolichopodidae	-	-	-	-	-
Empididae	-	-	2	-	-
Simuliidae	-	-	-	-	-
Adults	-	-	-	-	4
COLEOPTERA					
Dytiscidae	-	-	-	-	-
Haliplidae	-	-	-	-	-
Elmidae	-	-	-	-	-
ACARI	3	10	1	5	-
MOLLUSCA					
Physidae	-	-	-	-	-
Lymnaeidae	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-
Ancylidae					
Ferrissia	4	1	1	7	-

RIVER: North Saskatchewan River
SITE: Beverly Bridge Right Bank
DATE: 09/08/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
Undetermined	10	9	31	4	16
Mermithoidea	9	2	10	10	3
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	7	3	11	1	6
Naididae	72	24	67	102	47
Enchytraeidae	9	2	1	3	-
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Ephemeroptera					
Ephemerella	-	-	-	-	-
Baetis	-	-	-	-	-
Tricorythodes	-	-	-	-	-
Caenis	-	-	-	-	-
Rhithrogena	-	-	-	-	-
Heptagenia	-	-	-	-	-
Heptageniidae	1	-	-	1	-
Ephemera	-	-	-	-	-
Ephemeridae	-	-	-	-	-
Pseudocloeon	1	-	-	-	-
Paraleptophlebia	-	-	-	-	-
Centroptilum	-	-	-	-	-
Stenonema (Terminatum?)	-	-	-	-	-
Undetermined Nymphules	-	-	-	-	-
Adults	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	-	-	-	-	-
Cheumatopsyche	-	-	-	-	-
Arctopsyche	-	-	-	-	-
Hydropsychidae	3	-	-	2	-
Glossosoma	2	-	-	-	-
Brachycentrus	-	-	-	-	-
Oecetis	-	-	-	-	-
Ceraclea	-	-	-	-	-
Leptoceridae	-	-	-	-	-
Hydroptila	-	-	-	-	-
Neotrichia	-	-	-	-	-

SITE: **Beverly Bridge Right Bank**
DATE: 09/08/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Mayatrichia	-	-	-	-	-
Psychomyia	-	-	-	1	-
Adults	-	-	-	-	-
PLECOPTERA					
Isogenus	-	-	-	-	-
Acroneuria	-	-	-	-	-
Perlidae	-	-	-	-	-
Perlodidae	-	-	-	-	-
Undetermined	-	-	-	-	-
COLLEMBOLA	-	-	-	-	-
ODONATA					
Ophiogomphus	-	-	-	-	-
HEMIPTERA					
Corixidae	-	-	-	-	1
DIPTERA					
Chironomidae					
Chironomini	72	27	87	104	69
Tanytarsini	-	-	2	1	-
Orthocladiinae	67	22	93	143	62
Tanypodinae	2	1	-	-	-
Pupae	10	6	14	13	13
Ceratopogonidae	-	-	-	-	-
Tipulidae	-	-	-	-	-
Chaoboridae					
Chaoborus	-	1	-	-	-
Dolichopodidae	-	-	-	-	-
Empididae	-	-	-	-	-
Simuliidae	-	-	-	-	-
Adults	-	-	2	2	-
COLEOPTERA					
Dytiscidae	-	1	-	-	-
Haliplidae	-	-	-	-	-
Elmidae	-	-	-	-	-
ACARI	-	1	-	1	-
MOLLUSCA					
Physidae	-	-	-	-	-
Lymnaeidae	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-
Ancylidae					
Ferrissia	-	-	-	-	-

RIVER: North Saskatchewan River
SITE: Cloverdale Left Bank
DATE: 09/08/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
undetermined	2	2	8	6	6
Mermithoidea	3	7	48	20	6
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	2	24	4	32	8
Naididae	66	12	60	66	108
Enchytraeidae	4	-	4	4	2
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Ephemeroptera					
Ephemerella	15	4	16	2	6
Baetis	-	5	-	-	-
Tricorythodes	15	6	40	42	74
Caenis	-	-	-	-	-
Rhithrogena	8	19	4	4	12
Heptagenia	9	2	-	2	4
Heptageniidae	39	21	32	48	70
Ephemera	-	-	-	-	-
Ephemeridae	-	-	-	-	-
Pseudocloeon	3	20	8	2	10
Paraleptophlebia	-	-	-	-	-
Centroptilum	-	-	-	-	-
Stenonema (Terminatum?)	-	-	-	-	-
Undetermined Nymphules	-	5	2	2	2
Adults	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	28	37	36	8	4
Cheumatopsyche	1	-	4	-	-
Arctopsyche	-	1	-	-	-
Hydropsychidae	32	112	140	10	38
Glossosoma	3	9	-	8	8
Brachycentrus	-	-	-	-	1
Oecetis	1	-	-	-	-
Ceraclea	-	-	-	-	-
Leptoceridae	-	-	-	-	-
Hydroptila	-	1	-	-	-
Neotrichia	-	-	-	-	-

SITE: Cloverdale Left Bank
DATE: 09/08/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Mayatrichia	-	-	-	-	-
Psychomyia	-	1	-	-	-
Adults	-	-	-	-	-
PLECOPTERA					
Isogenus	-	-	-	-	-
Acroneuria	-	-	-	-	-
Perlidae	-	-	-	-	-
Perlodidae	-	-	-	-	-
Undetermined	21	13	38	10	14
COLLEMBOLA	1	2	-	2	2
ODONATA					
Ophiogomphus	-	-	-	-	-
HEMIPTERA					
Corixidae	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	8	28	8	30	24
Tanytarsini	8	4	12	14	12
Orthocladiinae	265	340	288	478	496
Tanypodinae	2	4	4	4	-
Pupae	11	24	8	8	22
Ceratopogonidae	-	-	-	-	1
Tipulidae	-	-	-	-	-
Chaoboridae					
Chaoborus	-	-	-	-	-
Dolichopodidae	-	-	-	-	-
Empididae	2	3	-	8	2
Simuliidae	-	-	-	-	-
Adults	-	-	-	-	-
COLEOPTERA					
Dytiscidae	-	-	-	-	-
Haliplidae	-	-	-	-	-
Elmidae	-	-	-	-	-
ACARI	4	7	28	24	12
MOLLUSCA					
Physidae	-	-	-	-	-
Lymnaeidae	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-
Ancylidae					
Ferrissia	1	-	-	-	-

RIVER: North Saskatchewan River
SITE: Cloverdale Right Bank
DATE: 09/08/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
undetermined	20	40	16	20	14
Mermithoidea	94	92	84	53	58
TURBELLARIA	4	-	2	5	2
OLIGOCHAETA					
Tubificidae	34	72	144	44	80
Naididae	350	792	652	416	1040
Enchytraeidae	-	-	-	-	1
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Ephemeroptera					
Ephemerella	-	-	1	-	-
Baetis	-	-	-	-	-
Tricorythodes	144	44	149	63	117
Caenis	-	-	2	-	-
Rhithrogena	-	-	-	-	-
Heptagenia	-	-	-	-	-
Heptageniidae	2	4	4	4	4
Ephemera	-	-	-	-	-
Ephemeridae	-	-	-	-	-
Pseudocloeon	6	-	2	2	1
Paraleptophlebia	-	-	-	-	-
Centroptilum	-	-	-	-	-
Stenonema (Terminatum?)	-	-	-	-	-
undetermined Nymphules	-	-	1	11	11
Adults	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	2	8	7	4	8
Cheumatopsyche	-	-	-	-	-
Arctopsyche	-	-	-	-	-
Hydropsychidae	8	4	7	6	13
Glossosoma	18	16	17	11	14
Brachycentrus	-	-	-	1	-
Oecetis	-	-	-	-	-
Ceraclea	-	-	-	2	2
Leptoceridae	-	-	-	-	-
Hydroptila	-	-	-	-	1
Neotrichia	-	-	-	-	-

SITE: Cloverdale Right Bank
DATE: 09/08/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Mayatrichia	-	-	-	-	-
Psychomyia	4	-	-	-	-
Adults	-	-	-	-	-
PLECOPTERA					
Isogenus	-	-	-	-	-
Acroneuria	-	-	-	-	-
Perlidae	-	-	-	-	-
Perlodidae	-	-	-	-	-
Undetermined	8	-	1	6	2
COLLEMBOLA	-	-	-	-	-
ODONATA					
Ophiogomphus	-	-	-	-	-
HEMIPTERA					
Corixidae	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	18	32	40	8	24
Tanytarsini	4	4	8	12	4
Orthocladiinae	272	276	544	308	452
Tanypodinae	32	12	28	12	32
Pupae	50	16	36	16	76
Ceratopogonidae	-	-	-	-	-
Tipulidae	-	-	-	-	-
Chaoboridae					
Chaoborus	-	-	-	-	-
Dolichopodidae	-	-	-	-	-
Empididae	2	-	2	2	1
Simuliidae	-	-	-	-	-
Adults	-	-	-	-	-
COLEOPTERA					
Dytiscidae	-	-	-	-	-
Haliplidae	-	-	-	-	-
Elmidae	-	-	-	-	-
ACARI	2	-	3	-	3
MOLLUSCA					
Physidae	-	-	-	-	-
Lymnaeidae	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-
Ancylidae					
Ferrissia	6	64	6	4	10

RIVER: North Saskatchewan River
SITE: Ft. Saskatchewan Left Bank
DATE: 17/08/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
undetermined	1	2	10	6	30
Mermithoidea	12	8	14	58	-
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	273	132	404	238	84
Naididae	16	34	48	10	86
Enchytraeidae	-	-	2	4	4
HIRUDINEA	1	-	1	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Ephemeroptera					
Ephemerella	-	-	-	-	-
Baetis	-	1	-	-	-
Tricorythodes	6	7	6	9	4
Caenis	-	-	-	-	-
Rhithrogena	-	-	-	-	-
Heptagenia	-	-	-	1	-
Heptageniidae	4	1	1	3	1
Ephemera	-	-	-	-	-
Ephemeridae	-	-	-	-	-
Pseudocloeon	-	-	-	-	-
Paraleptophlebia	-	-	-	-	-
Centroptilum	-	-	-	-	-
Stenonema (Terminatum?)	-	-	-	1	-
undetermined Nymphules	1	-	-	1	-
Adults	1	-	1	1	2
TRICHOPTERA					
Hydropsyche	2	-	2	7	1
Cheumatopsyche	-	-	-	-	1
Arctopsyche	-	-	-	-	-
Hydropsychidae	1	-	-	-	-
Glossosoma	-	1	1	1	-
Brachycentrus	-	-	-	-	-
Oecetis	-	-	-	-	-
Ceraclea	-	-	-	-	-
Leptoceridae	-	-	-	-	-
Hydroptila	1	-	-	-	-
Neotrichia	-	-	-	-	-

SITE: **Ft.** Saskatchewan Left Bank
DATE: 17/08/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Mayatrichia	-	-	-	-	-
Psychomyia	-	-	-	-	-
Adults	-	-	-	-	-
PLECOPTERA					
Isogenus	-	-	-	-	-
Acroneuria	-	-	-	-	-
Perlidae	-	-	-	-	-
Perlodidae	-	-	-	-	-
undetermined	1	-	-	-	-
COLLEMBOLA	-	-	-	-	-
ODONATA					
Ophiogomphus	-	-	-	-	-
HEMIPTERA					
Corixidae	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	11	14	48	24	12
Tanytarsini	3	6	18	8	28
Orthocladiinae	74	56	64	76	52
Tanypodinae	-	-	-	12	-
Pupae	1	6	6	2	-
Ceratopogonidae	-	-	-	2	-
Tipulidae	-	-	-	-	-
Chaoboridae					
Chaoborus	-	-	-	-	-
Dolichopodidae	-	-	-	-	-
Empididae	-	-	-	-	-
Simuliidae	-	-	-	-	-
Adults	3	6	6	8	9
COLEOPTERA					
Dytiscidae	-	-	-	-	-
Haliplidae	-	-	-	-	-
Elmidae	-	-	-	-	-
ACARI	-	1	-	-	-
MOLLUSCA					
Physidae	-	-	-	-	-
Lymnaeidae	-	-	-	1	-
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-
Ancylidae					
Ferrissia	42	13	34	24	4

RIVER: North Saskatchewan River
SITE: Ft. Saskatchewan Right Bank
DATE: 17/08/82

Sorted By: **B. Wright**
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
undetermined	5	-	1	6	-
Mermithoidea	31	37	38	24	32
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	137	584	234	972	102
Naididae	323	194	45	246	104
Enchytraeidae	-	-	-	-	-
HIRUDINEA	-	-	1	3	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Ephemeroptera					
Ephemerella	1	-	4	3	3
Baetis	1	-	4	7	4
Tricorythodes	19	18	556	35	112
Caenis	-	-	1	-	3
Rhithrogena	-	-	-	-	-
Heptagenia	1	-	24	3	13
Heptageniidae	2	2	45	2	13
Ephemera	-	-	-	-	-
Ephemeridae	-	-	-	-	-
Pseudocloeon	-	-	4	-	-
Paraleptophlebia	-	1	3	2	-
Centroptilum	-	-	-	-	-
Stenonema (Terminatum?)	-	-	-	-	-
undetermined Nymphules	4	2	25	3	13
Adults	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	3	8	121	10	53
Cheumatopsyche	-	-	49	-	-
Arctopsyche	-	-	-	-	-
Hydropsychidae	9	3	-	13	43
Glossosoma	-	1	1	-	1
Brachycentrus	-	-	-	-	-
Oecetis	-	-	-	-	-
Ceraclea	-	-	-	-	-
Leptoceridae	-	-	-	-	-
Hydroptila	-	-	1	-	1
Neotrichia	-	-	-	-	-

SITE: Ft. Saskatchewan Right Bank
DATE: 17/08/82 Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Mayatrichia	-	-	-	-	-
Psychomyia	-	-	1	1	3
Adults	-	-	-	-	-
PLECOPTERA					
Isogenus	-	-	-	-	-
Acroneuria	-	-	-	-	-
Perlidae	-	-	-	-	-
Perlodidae	-	-	-	-	-
Undetermined	-	-	7	2	5
COLLEMBOLA	-	-	1	-	-
ODONATA					
Ophiogomphus	-	1	-	-	-
HEMIPTERA					
Corixidae	7	-	1	2	-
DIPTERA					
Chironomidae					
Chironomini	4	11	25	30	12
Tanytarsini	19	16	9	16	5
Orthocladiinae	170	154	241	214	192
Tanypodinae	5	5	43	16	12
Pupae	1	7	4	16	11
Ceratopogonidae	-	-	-	-	-
Tipulidae	-	-	-	-	-
Chaoboridae					
Chaoborus	-	-	-	-	-
Dolichopodidae	-	-	-	-	-
Empididae	1	-	3	2	-
Simuliidae	-	-	-	-	-
Adults	19	7	3	24	1
COLEOPTERA					
Dytiscidae	1	1	-	-	-
Haliplidae	-	-	-	-	-
Elmidae	-	-	-	-	-
ACARI	1	-	-	-	-
MOLLUSCA					
Physidae	-	-	-	-	-
Lymnaeidae	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-
Ancylidae					
Ferrissia	1	5	16	5	1

RIVER: North Saskatchewan River
SITE: Sturgeon Left Bank
DATE: 17/08/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
undetermined	16	16	-	-	8
Mermithoidea	4	8	4	-	-
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	147	176	268	168	248
Naididae	85	100	18	24	24
Enchytraeidae	-	-	-	-	-
HIRUDINEA	2	1	-	-	1
CRUSTACEA					
Amphipoda					
Hyalella	12	17	17	28	12
Ephemeroptera					
Ephemerella	1	-	-	-	-
Baetis	2	-	-	-	-
Tricorythodes	30	16	69	31	10
Caenis	-	2	1	-	-
Rhithrogena	1	-	-	-	-
Heptagenia	5	-	-	1	-
Heptageniidae	5	2	15	-	1
Ephemera	-	-	-	-	-
Ephemeridae	-	-	-	-	-
Pseudocloeon	-	-	-	-	-
Paraleptophlebia	-	-	-	-	-
Centroptilum	-	3	-	-	-
Stenonema (Terminatum?)	-	-	-	-	-
undetermined Nymphules	2	2	4	4	2
Adults	4	-	-	4	2
TRICHOPTERA					
Hydropsyche	4	-	3	6	-
Cheumatopsyche	-	-	-	-	-
Arctopsyche	-	-	-	-	-
Hydropsychidae	1	-	-	2	-
Glossosoma	6	-	2	2	-
Brachycentrus	1	5	-	1	-
Oecetis	-	-	-	-	-
Ceraclea	-	-	-	2	1
Leptoceridae	-	1	1	-	-
Hydroptila	1	-	6	1	-
Neotrichia	-	2	-	-	-

SITE: Sturgeon Left Bank
DATE: 17/08/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Mayatrichia	-	-	-	-	-
Psychomyia	14	2	7	12	5
Adults	-	-	-	-	-
PLECOPTERA					
Isogenus	-	-	-	-	-
Acroneuria	-	-	-	-	-
Perlidae	-	-	-	-	-
Perlodidae	-	-	-	-	-
Undetermined	-	-	-	1	-
COLLEMBOLA	4	6	6	5	1
ODONATA					
Ophiogomphus	-	-	-	-	-
HEMIPTERA					
Corixidae	-	1	-	-	-
DIPTERA					
Chironomidae					
Chironomini	49	50	46	44	64
Tanytarsini	7	4	2	2	4
Orthocladiinae	39	26	62	28	24
Tanypodinae	4	4	4	6	-
Pupae	7	4	2	2	6
Ceratopogonidae	-	-	-	-	-
Tipulidae	-	-	-	-	-
Chaoboridae					
Chaoborus	-	-	-	-	-
Dolichopodidae	-	-	-	-	-
Empididae	3	-	-	-	-
Simuliidae	-	-	-	-	-
Adults	17	9	2	6	6
COLEOPTERA					
Dytiscidae	-	2	-	-	-
Haliplidae	-	-	-	-	-
Elmidae	10	4	4	1	1
ACARI	-	1	1	-	-
MOLLUSCA					
Physidae	-	-	-	-	-
Lymnaeidae	-	-	-	-	-
Sphaeriidae					
Pisidium	-	2	-	-	-
Sphaerium	-	-	1	-	-
Ancylidae					
Ferrissia	49	17	23	37	25

RIVER: North Saskatchewan River
SITE: Sturgeon Right Bank
DATE: 17/08/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
undetermined	5	4	5	1	-
Mermithoidea	4	9	4	12	7
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	285	249	297	262	253
Naididae	71	57	36	74	43
Enchytraeidae	-	-	-	-	-
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Ephemeroptera					
Ephemerella	1	2	1	2	2
Baetis	-	-	-	5	-
Tricorythodes	7	139	165	288	159
Caenis	2	-	1	1	-
Rhithrogena	-	-	-	-	-
Heptagenia	2	2	7	8	4
Heptageniidae	-	9	3	9	2
Ephemera	-	-	-	-	-
Ephemeridae	-	-	-	-	-
Pseudocloeon	4	-	1	-	1
Paraleptophlebia	-	-	-	-	-
Centroptilum	-	-	-	-	-
Stenonema (Terminatum?)	-	-	-	-	-
Undetermined Nymphules	-	-	1	3	2
Adults	1	2	1	1	-
TRICHOPTERA					
Hydropsyche	11	52	31	39	23
Cheumatopsyche	-	-	-	-	-
Arctopsyche	-	-	-	-	-
Hydropsychidae	-	3	2	1	1
Glossosoma	-	3	1	1	1
Brachycentrus	-	-	1	-	-
Oecetis	-	-	-	-	-
Ceraclea	-	-	-	-	-
Leptoceridae	-	-	2	-	-
Hydroptila	-	-	-	-	1
Neotrichia	-	-	-	-	-

SITE: Sturgeon Right Bank
DATE: 17/08/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Mayatrichia	-	-	-	-	-
Psychomyia	4	3	1	-	3
Adults	-	-	-	-	-
PLECOPTERA					
Isogenus	-	-	-	-	-
Acroneuria	-	-	-	-	-
Perlidae	-	-	-	-	-
Perlodidae	-	-	-	-	-
undetermined	-	2	3	10	-
COLLEMBOLA	4	2	2	3	2
ODONATA					
Ophiogomphus	-	-	-	-	1
HEMIPTERA					
Corixidae	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	16	35	48	27	44
Tanytarsini	5	3	4	4	8
Orthocladiinae	79	144	94	89	89
Tanypodinae	9	25	9	24	17
Pupae	3	9	10	11	10
Ceratopogonidae	-	-	1	-	-
Tipulidae	-	-	-	-	-
Chaoboridae					
Chaoborus	-	-	-	-	-
Dolichopodidae	-	-	-	-	-
Empididae	-	-	-	2	-
Simuliidae	-	-	-	-	-
Adults	9	21	11	9	8
COLEOPTERA					
Dytiscidae	-	-	-	-	-
Haliplidae	-	-	-	-	-
Elmidae	-	-	-	-	-
ACARI	-	-	-	1	-
MOLLUSCA					
Physidae	1	-	-	-	-
Lymnaeidae	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-
Ancylidae					
Ferrissia	35	35	13	22	31

RIVER: North Saskatchewan River
SITE: Vinca Bridge Left Bank
DATE: 12/08/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
undetermined	8	3	7	4	4
Mermithoidea	28	17	21	12	13
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	82	81	261	129	138
Naididae	39	21	31	78	65
Enchytraeidae	-	-	-	-	-
HIRUDINEA	-	1	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Ephemeroptera					
Ephemerella	-	-	-	-	-
Baetis	-	3	-	-	1
Tricorythodes	30	35	35	34	22
Caenis	-	1	-	-	-
Rhithrogena	-	-	-	-	-
Heptagenia	-	2	-	1	1
Heptageniidae	1	2	6	6	4
Ephemera	-	-	-	-	-
Ephemeridae	-	-	-	-	-
Pseudocloeon	-	-	-	-	-
Paraleptophlebia	-	-	-	-	1
Centroptilum	3	-	-	-	-
Stenonema (Terminatum?)	-	-	-	-	-
undetermined Nymphules	2	-	-	-	2
Adults	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	5	6	10	1	6
Cheumatopsyche	-	-	-	-	-
Arctopsyche	-	-	-	-	-
Hydropsychidae	1	2	5	6	27
Glossosoma	1	1	2	-	5
Brachycentrus	-	-	-	1	-
Oecetis	-	-	-	-	-
Ceraclea	-	-	-	-	-
Leptoceridae	3	2	1	-	2
Hydroptila	-	-	-	2	-
Neotrichia	-	-	-	-	-

SITE: Vinca Bridge Left Bank
DATE: 12/08/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Mayatrichia	-	-	-	-	-
Psychomyia	9	12	2	7	5
Adults	-	-	-	-	-
PLECOPTERA					
Isogenus	-	-	-	-	-
Acroneuria	-	-	-	-	-
Perlidae	-	-	-	-	-
Perlodidae	-	-	-	-	-
Undetermined	1	3	2	5	1
COLLEMBOLA	1	-	-	-	-
ODONATA					
Ophiogomphus	-	-	-	-	-
HEMIPTERA					
Corixidae	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	323	334	371	173	202
Tanytarsini	5	8	4	7	4
Orthocladiinae	33	270	245	277	330
Tanypodinae	5	5	4	4	4
Pupae	25	37	39	33	39
Ceratopogonidae	-	-	-	-	-
Tipulidae	-	-	-	-	-
Chaoboridae					
Chaoborus	-	-	-	-	-
Dolichopodidae	-	-	-	-	-
Empididae	-	-	-	-	1
Simuliidae	-	-	-	-	-
Adults	1	22	10	27	43
COLEOPTERA					
Dytiscidae	-	-	-	-	-
Haliplidae	-	-	-	-	-
Elmidae	-	-	-	1	-
ACARI	-	3	-	2	3
MOLLUSCA					
Physidae	-	-	-	-	-
Lymnaeidae	-	-	-	-	-
Sphaeriidae					
Pisidium	1	-	-	1	-
Sphaerium	-	-	1	-	-
Ancylidae					
Ferrissia	3	4	10	6	6

RIVER: North Saskatchewan River
SITE: Vinca Bridge Right Bank
DATE: 12/08/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
Undetermined	4	1	-	3	-
Mermithoidea	15	17	28	45	32
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	386	364	314	404	577
Naididae	64	33	61	53	67
Enchytraeidae	-	-	-	-	-
HIRUDINEA	3	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Ephemeroptera					
Ephemerella	-	-	-	-	-
Baetis	1	2	-	-	-
Tricorythodes	280	272	466	334	258
Caenis	1	-	-	-	-
Rhithrogena	-	-	-	-	-
Heptagenia	-	2	8	23	7
Heptageniidae	7	18	24	37	20
Ephemera	-	-	-	-	-
Ephemeridae	-	-	-	-	-
Pseudocloeon	2	1	4	7	12
Paraleptophlebia	1	1	-	-	-
Centroptilum	-	-	-	-	-
Stenonema (Terminatum?)	-	-	-	-	-
Undetermined Nymphules	4	1	1	8	3
Adults	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	6	2	5	35	13
Cheumatopsyche	-	-	-	-	-
Arctopsyche	-	-	-	-	-
Hydropsychidae	28	4	13	49	11
Glossosoma	-	-	-	1	1
Brachycentrus	-	-	-	-	-
Oecetis	-	-	-	-	-
Ceraclea	-	-	-	-	-
Leptoceridae	2	-	-	1	3
Hydroptila	1	-	1	1	-
Neotrichia	-	-	-	-	-

SITE: Vinca Bridge Right Bank
DATE: 12/08/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Mayatrichia	-	-	-	-	-
Psychomyia	28	8	17	33	21
Adults	-	-	-	-	-
PLECOPTERA					
Isogenus	-	-	-	-	-
Acroneuria	-	-	-	-	-
Perlidae	-	-	-	-	-
Perlodidae	-	-	-	-	-
Undetermined	3	2	2	13	3
COLLEMBOLA	-	-	-	-	-
ODONATA					
Ophiogomphus	-	-	-	-	-
HEMIPTERA					
Corixidae	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	104	88	85	89	181
Tanytarsini	5	67	5	8	8
Orthocladiinae	305	214	239	354	374
Tanypodinae	19	13	13	19	24
Pupae	12	18	12	13	27
Ceratopogonidae	-	-	-	-	-
Tipulidae	-	-	-	-	-
Chaoboridae					
Chaoborus	-	-	-	-	-
Dolichopodidae	-	-	-	-	-
Empididae	1	4	1	-	1
Simuliidae	-	-	-	-	-
Adults	7	4	3	7	1
COLEOPTERA					
Dytiscidae	-	-	-	-	-
Haliplidae	-	-	-	-	-
Elmidae	-	-	-	-	-
ACARI	-	1	2	4	7
MOLLUSCA					
Physidae	-	-	-	-	-
Lymnaeidae	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	1	-	3
Sphaerium	-	-	-	-	-
Ancylidae					
Ferrissia	7	2	5	4	20

RIVER: North Saskatchewan River
SITE: Pakan Bridge Left Bank
DATE: 12/08/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
Undetermined	1	3	4	4	8
Mermithoidea	16	41	9	13	13
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	68	72	57	82	86
Naididae	11	9	20	16	8
Enchytraeidae	-	-	-	-	-
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Ephemeroptera					
Ephemerella	-	-	1	-	-
Baetis	3	5	4	4	-
Tricorythodes	383	375	141	128	88
Caenis	1	1	-	-	-
Rhithrogena	-	-	-	-	-
Heptagenia	3	-	15	10	-
Heptageniidae	100	106	98	116	17
Ephemera	-	-	-	-	-
Ephemeridae	-	1	-	-	-
Pseudocloeon	25	20	7	14	3
Paraleptophlebia	1	3	-	-	-
Centroptilum	9	23	5	18	-
Stenonema (Terminatum?)	-	-	-	-	-
Undetermined Nymphules	65	36	73	176	52
Adults	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	11	16	37	6	-
Cheumatopsyche	-	1	3	2	-
Arctopsyche	-	-	-	-	-
Hydropsychidae	24	33	83	44	1
Glossosoma	1	4	-	4	1
Brachycentrus	1	1	-	-	-
Oecetis	-	-	-	-	-
Ceraclea	-	-	-	-	-
Leptoceridae	1	-	-	-	-
Hydroptila	-	-	-	-	-
Neotrichia	-	-	-	-	-

SITE: Pakan Bridge Left Bank
DATE: 12/08/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Mayatrichia	-	-	-	-	-
Psychomyia	8	1	12	-	-
Adults	-	-	-	-	-
PLECOPTERA					
Isogenus	1	7	-	2	-
Acroneuria	-	-	-	-	-
Perlidae	-	-	-	-	-
Perlodidae	-	-	-	-	-
Undetermined	17	104	44	36	4
COLLEMBOLA	-	-	-	1	-
ODONATA					
Ophiogomphus	-	-	1	-	-
HEMIPTERA					
Corixidae	-	-	-	-	1
DIPTERA					
Chironomidae					
Chironomini	106	65	86	126	84
Tanytarsini	27	21	25	59	7
Orthocladiinae	113	149	168	148	32
Tanypodinae	13	8	3	13	5
Pupae	15	8	13	3	12
Ceratopogonidae	1	-	-	-	-
Tipulidae	-	-	-	-	-
Chaoboridae					
Chaoborus	-	-	-	-	-
Dolichopodidae	-	-	-	-	-
Empididae	-	1	1	3	-
Simuliidae	-	-	-	-	-
Adults	28	16	30	68	35
COLEOPTERA					
Dytiscidae	-	-	-	-	-
Haliplidae	-	-	-	-	-
Elmidae	-	-	1	-	-
ACARI	5	1	4	14	-
MOLLUSCA					
Physidae	-	-	-	-	-
Lymnaeidae	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	3	2	-
Sphaerium	-	-	-	-	-
Ancylidae					
Ferrissia	1	-	3	12	1

RIVER: North Saskatchewan River
SITE: Pakan Bridge Right Bank
DATE: 12/08/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
undetermined	4	-	-	-	1
Mermithoidea	70	20	15	61	20
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	116	114	262	90	133
Naididae	76	39	29	53	20
Enchytraeidae	-	-	-	-	-
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Ephemeroptera					
Ephemerella	-	-	-	-	-
Baetis	8	16	1	1	-
Tricorythodes	249	121	112	166	104
Caenis	-	-	1	-	1
Rhithrogena	-	-	-	-	-
Heptagenia	7	9	4	11	-
Heptageniidae	72	40	15	82	52
Ephemera	-	-	-	-	-
Ephemeridae	-	-	-	1	-
Pseudocloeon	25	20	7	16	13
Paraleptophlebia	1	-	1	-	-
Centroptilum	-	1	-	-	-
Stenonema (Terminatum?)	-	-	-	-	-
undetermined Nymphules	124	82	173	180	141
Adults	-	-	1	1	-
TRICHOPTERA					
Hydropsyche	19	9	7	16	11
Cheumatopsyche	4	3	-	-	-
Arctopsyche	-	-	-	-	-
Hydropsychidae	20	17	3	13	9
Glossosoma	4	-	3	4	4
Brachycentrus	-	-	-	-	-
Oecetis	-	-	-	-	-
Ceraclea	-	-	-	-	-
Leptoceridae	-	-	-	-	-
Hydroptila	-	-	-	-	1
Neotrichia	-	-	-	-	-

SITE: Pakan Bridge Right Bank
DATE: 12/08/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Mayatrichia	-	-	-	1	-
Psychomyia	8	5	4	5	7
Adults	-	-	-	-	-
PLECOPTERA					
Isogenus	-	-	-	-	-
Acroneuria	-	-	-	-	-
Perlidae	-	-	-	-	-
Perlodidae	-	-	-	-	-
undetermined	11	9	1	13	15
COLLEMBOLA	-	-	-	-	1
ODONATA					
Ophiogomphus	-	-	-	1	-
HEMIPTERA					
Corixidae	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	45	25	40	35	23
Tanytarsini	5	4	5	9	1
Orthocladiinae	85	102	112	136	82
Tanypodinae	12	4	11	7	5
Pupae	12	5	3	8	3
Ceratopogonidae	-	1	-	-	-
Tipulidae	-	-	-	-	-
Chaoboridae					
Chaoborus	-	-	-	-	-
Dolichopodidae	-	-	-	-	-
Empididae	-	3	-	4	3
Simuliidae	-	-	-	-	-
Adults	73	247	242	233	247
COLEOPTERA					
Dytiscidae	-	-	-	-	-
Haliplidae	-	-	-	-	-
Elmidae	-	-	-	-	3
ACARI	8	5	1	4	1
MOLLUSCA					
Physidae	-	-	-	-	-
Lymnaeidae	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-
Ancylidae					
Ferrissia	1	1	1	-	7

RIVER: North Saskatchewan River
SITE: Devon Left Bank
DATE: 23/9/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	3	7	1	5	6
NEMATODA					
undetermined	1	-	1	1	-
Mermithoidea	-	1	-	-	-
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	-	-	-	-	-
Naididae	21	3	3	1	2
Enchytraeidae	1	5	8	1	6
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Gammarus	-	-	-	-	-
EPHEMEROPTERA					
Ephemerella	2	9	4	7	1
Baetis	5	2	-	1	1
Tricorythodes	-	-	1	-	-
Caenis	-	-	-	-	-
Rhithrogena	8	4	15	4	9
Heptagenia	1	4	-	-	-
Heptageniidae	1	3	-	-	-
Paraleptophlebia	-	-	-	-	-
Leptophlebia	-	-	-	-	-
Centroptilum	-	-	-	-	-
Parameletus	-	-	-	-	-
Stenonema	-	-	-	-	-
Ameletus	-	-	-	-	-
Ephemera	-	-	-	-	-
Pseudocloeon	-	-	-	-	-
undetermined Nymphules	-	-	-	-	1
TRICHOPTERA					
Hydropsyche	-	2	-	-	-
Cheumatopsyche	-	1	2	-	1
Hydropsychidae	1	1	1	-	-
Glossosoma	-	-	-	-	-
Brachycentrus	-	-	-	-	2
Oecetis	-	-	-	-	-
Psychomyia	-	-	-	-	-
Neureclipsis	-	-	-	-	-

SITE: Devon Left Bank
DATE: 23/9/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Ceraclea	-	-	-	-	-
Polycentropus	-	-	-	-	-
Leptoceridae	-	-	-	-	-
Neotrichia	-	1	-	-	-
Lepidostoma	-	-	-	-	-
Hydroptilidae	-	-	-	-	-
PLECOPTERA					
Isoperla	-	-	2	-	-
Alloperla	-	-	-	-	-
Isogenus	2	8	-	2	-
Taenionema	7	3	-	4	2
Perlodidae	-	-	-	-	-
Chloroperlidae	2	1	1	15	5
Capniidae	-	-	-	-	-
undetermined	16	23	15	12	15
COLLEMBOLA	-	-	-	-	-
ODONATA	-	-	-	-	-
HEMIPTERA	1	-	3	-	-
Corixidae					
COLEOPTERA					
Adults	-	-	-	-	-
Elmidae Larvae	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	2	-	2	-	-
Tanytarsini	4	6	2	10	4
Orthocladiinae	1	-	1	4	2
Tanypodinae	-	-	1	2	1
Pupae	-	-	-	-	-
Ceratopogonidae	12	11	30	12	14
Tipulidae	1	3	4	2	6
Ephydridae	-	-	-	-	-
Tabanidae	-	-	-	-	-
Rhagionidae	-	-	-	-	-
Empididae	1	1	-	-	-
Dolichopodidae	-	-	-	-	-
Simuliidae	-	-	-	-	-
Adult	-	-	-	-	-
ACARI	-	-	1	-	1
MOLLUSCA					
Physidae	-	-	-	-	-

SITE: **Devon Left Bank**
DATE: 23/9/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Lymnaeidae	-	-	-	-	-
Planorbidae	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-
Ancylidae					
Ferrissia	-	-	-	-	-

RIVER: **North Saskatchewan River**
SITE: **Devon Right Bank**
DATE: 23/9/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	4	2	6	3	5
NEMATODA					
undetermined	-	1	2	-	1
Mermithoidea	1	3	2	6	-
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	1	-	-	-	-
Naididae	9	15	7	6	3
Enchytraeidae	3	7	-	8	1
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Gammarus	-	-	-	-	-
EPHEMEROPTERA					
Ephemerella	-	1	13	11	6
Baetis	-	2	13	-	1
Tricorythodes	-	-	1	1	1
Caenis	-	-	-	-	-
Rhithrogena	-	-	26	4	3
Heptagenia	2	-	7	1	2
Heptageniidae	8	3	15	1	5
Paraleptophlebia	-	-	1	-	-
Leptophlebia	-	-	-	-	-
Centroptilum	-	-	1	-	2
Parameletus	-	-	-	-	-
Stenonema	-	-	-	-	-
Ameletus	-	-	1	-	-
Ephemera	-	-	-	-	1
Pseudocloeon	-	-	-	-	-
undetermined Nymphules	2	5	7	-	3
TRICHOPTERA					
Hydropsyche	1	1	1	-	-
Cheumatopsyche	-	-	-	-	-
Hydropsychidae	2	2	3	5	-
Glossosoma	-	-	-	-	-
Brachycentrus	-	-	-	-	-
Oecetis	-	-	-	-	-
Psychomyia	-	-	-	-	2
Neureclipsis	-	-	-	-	-

SITE: Devon Right Bank
DATE: 23/9/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Ceraclea	-	-	-	-	-
Polycentropus	1	-	-	-	-
Leptoceridae	2	3	2	3	-
Neotrichia	-	-	-	1	-
Lepidostoma	-	-	-	-	-
Hydroptilidae	-	-	-	-	-
PLECOPTERA	-	-	1	-	-
Isoperla	-	-	3	6	2
Alloperla	-	-	-	-	2
Isogenus	49	37	101	95	96
Taenionema	-	-	-	-	-
Perlodidae	-	-	-	-	-
Chloroperlidae	-	-	-	-	-
Capniidae	-	-	-	-	-
undetermined	13	29	74	36	18
COLLEMBOLA	-	-	-	-	-
ODONATA	-	-	-	-	-
HEMIPTERA					
Corixidae	6	8	51	28	91
COLEOPTERA					
Adults	-	-	-	-	-
Elmidae Larvae	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	2	3	-	2	-
Tanytarsini	3	-	13	13	-
Orthocladiinae	3	4	8	4	3
Tanypodinae	1	1	3	-	1
Pupae	-	-	-	-	-
Ceratopogonidae	1	-	-	-	-
Tipulidae	-	-	1	-	-
Ephydridae	-	-	-	-	-
Tabanidae	-	-	-	-	-
Rhagionidae	-	-	-	-	-
Empididae	1	-	-	3	1
Dolichopodidae	-	-	-	-	-
Simuliidae	-	-	-	-	-
Adult	-	-	-	-	-
ACARI	1	2	-	1	-
MOLLUSCA					
Physidae	-	-	-	-	-

SITE: **Devon Right Bank**
DATE: 23/9782

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Lymnaeidae	-	-	-	-	-
Planorbidae	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-
Ancylidae					
Ferrissia	1	-	-	-	-

RIVER: North Saskatchewan River
SITE: E.L. Smith Left Bank
DATE: 1/10/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
undetermined	20	6	11	13	10
Mermithoidea	5	1	4	-	1
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	1	2	2	2	1
Naididae	190	224	87	70	136
Enchytraeidae	2	8	4	1	2
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Gammarus	-	-	-	-	-
EPHEMEROPTERA					
Ephemerella	-	-	-	-	-
Baetis	-	-	-	-	-
Tricorythodes	-	-	-	-	-
Caenis	-	-	-	-	-
Rhithrogena	-	-	-	-	-
Heptagenia	-	-	-	-	-
Heptageniidae	-	-	-	-	-
Paraleptophlebia	-	-	-	-	-
Leptophlebia	-	-	-	-	-
Centroptilum	-	-	-	-	-
Parameletus	-	-	-	-	-
Stenonema	-	-	-	-	-
Ameletus	-	-	-	-	-
Ephemera	-	-	-	-	-
Pseudocloeon	-	-	-	-	-
undetermined Nymphules	-	-	-	-	-
	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	-	-	-	-	-
Cheumatopsyche	-	-	-	-	-
Hydropsychidae	-	-	-	-	-
Glossosoma	-	-	-	-	-
Brachycentrus	-	-	-	-	-
Oecetis	-	-	-	-	-
Psychomyia	-	-	-	-	-
Neureclipsis	-	-	-	-	-

SITE: E.L. Smith Left Bank
DATE: 1/10/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Ceraclea	-	-	-	-	-
Polycentropus	-	-	-	-	-
Leptoceridae	-	-	-	-	-
Neotrichia	-	1	-	-	-
Lepidostoma	-	-	-	-	-
Hydroptilidae	-	-	-	-	-
PLECOPTERA					
Isoperla	-	-	-	-	-
Alloperla	-	-	-	-	-
Isogenus	-	-	-	-	-
Taenionema	-	-	-	-	-
Perlodidae	1	-	-	-	-
Chloroperlidae	1	2	-	-	-
Capniidae	-	-	-	-	-
undetermined	-	-	-	-	-
COLLEMBOLA	-	-	-	-	-
ODONATA	-	-	-	-	-
HEMIPTERA					
Corixidae	6	28	5	12	6
COLEOPTERA					
Adults	1	7	1	2	-
Elmidae Larvae	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	5	8	2	1	4
Tanytarsini	3	2	3	-	5
Orthocladiinae	-	1	-	1	4
Tanypodinae	-	-	-	-	-
Pupae	-	-	-	-	-
Ceratopogonidae	-	-	-	-	-
Tipulidae	-	-	-	-	-
Ephydridae	-	-	-	-	-
Tabanidae	-	-	-	-	-
Rhagionidae	-	-	-	-	-
Empididae	1	-	1	2	-
Dolichopodidae	1	-	-	-	-
Simuliidae	-	-	-	-	-
Adult	-	-	-	-	-
ACARI	-	-	-	-	-
MOLLUSCA					
Physidae	-	-	-	-	-

SITE: E.L. Smith Left Bank

DATE: 1/10/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Lymnaeidae	-	-	-	-	-
Planorbidae	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-
Ancylidae					
Ferrissia	-	-	-	-	-

RIVER: North Saskatchewan River
SITE: E.L. Smith Right Bank
DATE: 1/10/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
undetermined	31	10	16	14	19
Mermithoidea	10	-	-	4	4
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	4	14	4	1	7
Naididae	30	27	24	19	9
Enchytraeidae	5	2	3	2	3
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella					
Gammarus	-	-	-	-	-
EPHEMEROPTERA					
Ephemerella	-	-	-	-	-
Baetis	-	-	-	-	-
Tricorythodes	-	-	-	-	-
Caenis	-	-	-	-	-
Rhithrogena	-	-	-	-	-
Heptagenia	-	-	-	-	-
Heptageniidae	-	-	-	-	-
Paraleptophlebia	-	1	-	-	-
Leptophlebia	-	-	1	-	1
Centroptilum	-	-	-	-	-
Parameletus	-	-	-	-	-
Stenonema	-	-	-	-	-
Ameletus	-	-	-	-	-
Ephemera	-	-	-	1	-
Pseudocloeon	-	-	-	-	-
undetermined Nymphules	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	-	-	-	-	-
Cheumatopsyche	-	-	-	-	-
Hydropsychidae	-	-	-	-	-
Glossosoma	-	-	-	-	-
Brachycentrus	-	-	-	-	-
Oecetis	-	-	-	-	-
Psychomyia	-	-	-	-	-
Neureclipsis	-	-	-	-	-

SITE: E.L. Smith Right Bank
DATE: 1/10/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Ceraclea	-	-	-	-	-
Polycentropus	-	-	-	-	-
Leptoceridae	1	-	-	-	-
Neotrichia	-	-	-	-	-
Lepidostoma	-	-	-	-	-
Hydroptilidae	-	-	-	-	-
PLECOPTERA					
Isoperla	1	-	-	-	1
Alloperla	-	-	-	-	-
Isogenus	-	-	-	-	-
Taenionema	3	-	2	1	10
Perlodidae	-	-	-	-	-
Chloroperlidae	-	-	-	-	-
Capniidae	-	-	-	-	-
Undetermined	-	-	-	-	-
COLLEMBOLA	-	-	-	-	-
ODONATA	-	-	-	-	-
HEMIPTERA					
Corixidae	2,500	10,000	50,000	-	20,000
COLEOPTERA					
Adults	4	4	2	1	9
Elmidae Larvae	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	93	196	98	79	44
Tanytarsini	3	2	4	4	3
Orthocladiinae	10	9	6	5	6
Tanypodinae	1	-	4	-	1
Pupae	-	-	-	-	-
Ceratopogonidae	11	8	15	5	3
Tipulidae	-	-	-	-	-
Ephydridae	-	-	-	-	-
Tabanidae	-	-	-	-	-
Rhagionidae	-	-	-	-	-
Empididae	-	-	-	-	-
Dolichopodidae	-	-	-	-	-
Simuliidae	-	-	-	-	-
Adult	1	-	-	4	-
ACARI	-	-	-	-	-
MOLLUSCA					
Physidae	-	-	-	-	-

SITE: E.L. Smith Right Bank
DATE: 1/10/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Lymnaeidae	-	-	-	-	-
Planorbidae	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-
Ancylidae					
Ferrissia	4	-	3	5	9

RIVER: North Saskatchewan River
SITE: Rossdale Left Bank
DATE: 1/10/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
Undetermined	63	50	144	48	21
Mermithoidea	5	2	2	5	4
TURBELLARIA	3	-	4	3	-
OLIGOCHAETA					
Tubificidae	416	298	258	205	732
Naididae	706	2150	1572	782	826
Enchytraeidae	-	-	-	-	-
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Gammarus	-	-	-	-	-
EPHEMEROPTERA					
Ephemerella	-	-	-	-	-
Baetis	-	-	-	-	-
Tricorythodes	-	-	-	-	-
Caenis	-	-	-	-	-
Rhithrogena	-	-	-	-	-
Heptagenia	-	-	-	-	-
Heptageniidae	-	-	-	-	-
Paraleptophlebia	-	-	-	-	-
Leptophlebia	-	-	-	-	-
Centroptilum	-	-	-	-	-
Parameletus	-	-	-	-	1
Stenonema	-	-	-	-	-
Ameletus	-	-	-	-	-
Ephemera	-	-	-	-	-
Pseudocloeon	-	-	-	-	-
Undetermined Nymphules	=	=	=	=	=
TRICHOPTERA					
Hydropsyche					
Cheumatopsyche	-	-	-	-	-
Hydropsychidae	-	-	-	-	-
Glossosoma	1	-	-	-	-
Brachycentrus	-	-	-	-	-
Oecetis	=	=	=	=	=
Psychomyia	-	-	-	-	-
Neureclipsis	-	-	-	-	-

SITE: Rossdale Left Bank
DATE: 1/10/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Ceraclea	-	-	-	-	-
Polycentropus	-	-	-	-	-
Leptoceridae	-	-	-	-	-
Neotrichia	-	-	-	-	-
Lepidostoma	-	-	-	1	-
Hydroptilidae	-	-	-	-	-
PLECOPTERA					
Isoperla	-	-	-	-	-
Alloperla	-	-	-	-	-
Isogenus	-	-	-	-	-
Taenionema	-	-	-	-	-
Perlodidae	-	-	-	-	-
Chloroperlidae	-	-	-	-	-
Capniidae	-	-	-	-	-
undetermined	-	-	-	1	-
COLLEMBOLA	-	-	-	1	-
ODONATA	-	-	-	-	-
HEMIPTERA					
Corixidae	34	34	29	78	18
COLEOPTERA					
Adults	7	-	-	20	-
Elmidae Larvae	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	2	6	-	3	1
Tanytarsini	-	2	-	-	-
Orthocladiinae	1	38	18	4	9
Tanypodinae	1	2	-	-	1
Pupae	1	-	2	5	-
Ceratopogonidae	-	-	-	-	-
Tipulidae	-	-	-	-	-
Ephydridae	-	-	-	-	-
Tabanidae	-	-	-	-	-
Rhagionidae	-	-	-	-	-
Empididae	-	-	-	-	-
Dolichopodidae	-	-	-	-	-
Simuliidae	-	-	-	-	-
Adult	6	4	1	8	3
ACARI	-	-	1	1	-
MOLLUSCA					
Physidae	1	-	-	-	-

SITE: Rossdale Left Bank
DATE: 1/10/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Lymnaeidae	-	-	1	-	-
Planorbidae	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-
Ancylidae					
Ferrissia	1	-	-	-	1

RIVER: North Saskatchewan River
SITE: Rossdale Right Bank
DATE: 1/10/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	1	-	-	-
NEMATODA					
undetermined	38	54	25	14	25
Mermithoidea	32	49	27	12	46
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	3	19	7	83	5
Naididae	209	307	174	6	209
Enchytraeidae	1	1	1	1	1
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Gammarus	-	-	-	-	-
EPHEMEROPTERA					
Ephemerella	1	-	-	1	-
Baetis	-	-	1	-	-
Tricorythodes	-	-	-	-	-
Caenis	-	-	-	-	-
Rhithrogena	-	-	-	-	1
Heptagenia	-	-	-	-	-
Heptageniidae	1	-	1	-	-
Paraleptophlebia	-	-	-	-	-
Leptophlebia	-	-	-	-	-
Centroptilum	-	-	-	-	-
Parameletus	-	-	-	-	-
Stenonema	-	-	-	-	-
Ameletus	-	-	-	-	-
Ephemera	-	-	-	-	-
Pseudocloeon	-	-	-	-	-
undetermined Nymphules	1	-	-	-	-
TRICHOPTERA					
Hydropsyche	-	-	-	-	-
Cheumatopsyche	-	-	-	-	-
Hydropsychidae	-	-	-	-	-
Glossosoma	-	-	-	-	-
Brachycentrus	-	-	-	-	-
Oecetis	-	-	-	-	-
Psychomyia	-	-	-	-	-
Neureclipsis	-	-	-	-	-
	-	-	-	-	-

SITE: Rossdale Right Bank
DATE: 1/10/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Ceraclea	-	-	-	-	-
Polycentropus	-	-	-	-	-
Leptoceridae	-	-	-	-	-
Neotrichia	-	-	-	-	-
Lepidostoma	-	-	-	-	-
Hydroptilidae	-	-	-	-	-
PLECOPTERA					
Isoperla	-	-	-	-	-
Alloperla	-	-	-	-	-
Isogenus	-	-	-	-	-
Taenionema	-	-	-	-	1
Perlodidae	-	-	-	-	-
Chloroperlidae	-	-	-	-	-
Capniidae	-	-	-	-	-
Undetermined	2	1	-	2	1
COLLEMBOLA	-	-	-	-	-
ODONATA	-	-	-	-	-
HEMIPTERA					
Corixidae	8	3	11	3	7
COLEOPTERA					
Adults	-	-	-	-	-
Elmidae Larvae	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	1	2	-	-	1
Tanytarsini	-	-	-	-	-
Orthocladiinae	68	70	59	37	74
Tanypodinae	1	-	-	-	-
Pupae	3	4	6	1	5
Ceratopogonidae	-	-	-	-	-
Tipulidae					
Ephydridae	-	-	-	-	-
Tabanidae	-	-	-	-	-
Rhagionidae	-	-	-	-	-
Empididae	-	-	-	-	-
Dolichopodidae	-	-	-	-	-
Simuliidae	-	-	-	-	-
Adult	4	-	-	3	2
Erioptera	1	1	4	-	1
ACARI	-	-	-	-	-
MOLLUSCA					
Physidae	-	-	-	-	-

SITE: Rossdale Right Bank
DATE: 1/10/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Lymnaeidae	-	-	-	-	-
Planorbidae	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-
Ancylidae					
Ferrissia	-	-	-	-	-

RIVER: North Saskatchewan River Sorted By: B. Wright
SITE: 50th St. Footbridge Left Bank Counts and Identification: A. M. Anderson
DATE: 29/9/82

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
undetermined	44	20	32	20	24
Mermithoidea	-	-	24	4	16
TURBELLARIA					
OLIGOCHAETA					
Tubificidae	80	52	24	12	48
Naididae	3156	7112	4204	3884	2948
Enchytraeidae	-	4	-	-	-
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Gammarus	-	-	-	-	-
EPHEMEROPTERA					
Ephemerella	-	4	2	2	4
Baetis	-	-	-	-	-
Tricorythodes	-	-	-	-	-
Caenis	-	-	-	-	-
Rhithrogena	-	-	-	-	-
Heptagenia	1	2	-	-	-
Heptageniidae	-	-	-	-	-
Paraleptophlebia	-	-	-	-	-
Leptophlebia	1	1	-	-	-
Centroptilum	-	-	-	-	-
Parameletus	-	-	-	-	-
Stenonema	-	-	-	-	-
Ameletus	-	-	-	-	-
Ephemera	-	-	-	-	-
Pseudocloeon	-	-	-	-	-
undetermined Nymphules	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	-	-	-	-	-
Cheumatopsyche	-	-	-	-	-
Hydropsychidae	-	-	-	-	-
Glossosoma	-	1	-	-	1
Brachycentrus	-	-	-	-	-
Oecetis	-	-	-	-	-
Psychomyia	-	-	-	-	-
Neureclipsis	-	-	-	-	-

SITE: 50th St. Footbridge Left Bank
DATE: 29/9/82 Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Ceraclea	-	-	-	-	-
Polycentropus	-	-	-	-	-
Leptoceridae	-	-	-	-	-
Neotrichia	-	-	-	-	-
Lepidostoma	-	-	-	-	-
Hydroptilidae	-	-	-	-	1
PLECOPTERA					
Isoperla	-	-	-	-	-
Alloperla	-	-	-	-	-
Isogenus	-	-	-	-	-
Taenionema	1	1	1	1	1
Perlodidae	-	-	-	-	-
Chloroperlidae	-	-	-	-	-
Capniidae	-	-	-	-	-
undetermined	-	-	-	-	-
COLLEMBOLA	-	-	-	-	-
ODONATA	-	-	-	-	-
HEMIPTERA					
Corixidae	15	33	51	15	9
COLEOPTERA					
Adults	1	12	-	2	-
Elmidae Larvae	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	-	4	8	-	-
Tanytarsini	-	-	-	-	-
Orthocladiinae	84	564	240	264	328
Tanypodinae	-	-	-	-	-
Pupae	-	20	12	16	20
Ceratopogonidae	-	-	-	-	-
Tipulidae					
Ephydridae	-	-	-	-	-
Tabanidae	-	-	-	-	-
Rhagionidae	-	-	-	-	-
Empididae	-	-	-	-	-
Dolichopodidae	-	-	-	-	-
Simuliidae	-	-	-	-	-
Adult	1	1	1	2	-
Erioptera	-	-	-	1	-
ACARI					
MOLLUSCA					
Physidae	-	-	-	-	-

SITE: 50th St. Footbridge Left Bank
DATE: 29/9/82 Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Lymnaeidae	-	-	-	-	-
Planorbidae	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-
Ancylidae					
Ferrissia	9	9	10	8	13

RIVER: North Saskatchewan River Sorted By: B. Wright
SITE: 50th St. FootBridge Right Bank Counts and Identification: A. M. Anderson
DATE: 29/9/82

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
undetermined	100	40	100	100	68
Mermithoidea	72	96	28	24	56
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	92	24	8	36	84
Naididae	4366	2988	3244	2988	5416
Enchytraeidae	4	-	4	-	4
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Gammarus	-	-	-	-	-
EPHEMEROPTERA					
Ephemerella	6	21	6	-	3
Baetis	-	-	-	-	-
Tricorythodes	-	24	13	3	2
Caenis	-	-	1	-	-
Rhithrogena	-	-	-	-	-
Heptagenia	-	-	-	-	-
Heptageniidae	-	-	-	-	-
Paraleptophlebia	-	-	-	-	-
Leptophlebia	-	-	-	-	-
Centroptilum	-	-	-	-	-
Parameletus	-	-	-	-	-
Stenonema	-	-	-	-	-
Ameletus	-	-	-	-	-
Ephemera	1	-	-	-	-
Pseudocloeon	-	-	-	-	-
undetermined Nymphules	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	-	-	-	-	-
Cheumatopsyche	-	1	-	-	-
Hydropsychidae	-	-	-	-	-
Glossosoma	-	-	-	-	-
Brachycentrus	1	-	-	-	-
Oecetis	-	-	-	-	-
Psychomyia	-	-	-	-	-
Neureclipsis	-	-	-	-	-

SITE: 50th St. Footbridge Right Bank
DATE: 29/9/82 Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Ceraclea	-	-	-	-	-
Polycentropus	-	-	-	-	-
Leptoceridae	-	-	-	-	-
Neotrichia	-	-	-	-	-
Lepidostoma	-	-	-	-	-
Hydroptilidae	-	-	-	-	-
PLECOPTERA					
Isoperla	-	-	1	-	-
Alloperla	-	-	-	-	-
Isogenus	-	-	-	-	-
Taenionema	1	1	1	-	-
Perlodidae	-	-	-	-	-
Chloroperlidae	-	-	-	-	-
Capniidae	-	-	-	-	-
Undetermined	-	-	-	-	1
COLLEMBOLA	-	-	-	-	-
ODONATA	-	-	-	-	-
HEMIPTERA					
Corixidae	8	21	9	2	19
COLEOPTERA					
Adults	4	1	-	-	2
Elmidae Larvae					
DIPTERA					
Chironomidae					
Chironomini	12	4	-	-	4
Tanytarsini	-	-	-	-	-
Orthocladiinae	272	548	252	156	276
Tanypodinae	-	-	-	-	-
Pupae	44	21	8	32	12
Ceratopogonidae	-	-	-	-	-
Tipulidae	-	-	-	-	-
Ephydridae	-	-	-	-	-
Tabanidae	-	-	-	-	-
Rhagionidae	-	-	-	-	-
Empididae	-	-	-	-	-
Dolichopodidae	-	-	-	-	-
Simuliidae	-	-	-	-	-
Adult	1	1	3	3	1
Erioptera	-	1	-	-	1
ACARI	-	2	-	-	-
MOLLUSCA					
Physidae	-	-	-	-	-

SITE: 50th St. Footbridge Right Bank
DATE: 29/9/82 Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Lymnaeidae	-	-	-	-	-
Planorbidae	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-
Ancylidae					
Ferrissia	-	2	2	-	2

RIVER: North Saskatchewan River
SITE: Rundle Footbridge Left Bank
DATE: 29/9/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
Undetermined	24	44	12	40	16
Mermithoidea	44	44	72	76	64
TURBELLARIA	-	1	1	-	-
OLIGOCHAETA					
Tubificidae	12	40	12	48	44
Naididae	3408	2624	3183	2289	2484
Enchytraeidae	4	8	-	4	4
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Gammarus	-	-	-	-	-
EPHEMEROPTERA					
Ephemerella	70	60	58	81	55
Baetis	5	1	3	4	3
Tricorythodes	54	11	15	13	25
Caenis	1	-	-	-	-
Rhithrogena	1	-	2	-	-
Heptagenia	15	9	14	6	3
Heptageniidae	1	2	2	3	5
Paraleptophlebia	-	-	-	-	-
Leptophlebia	-	-	1	-	-
Centroptilum	-	-	-	-	-
Parameletus	-	-	-	-	-
Stenonema	-	-	-	-	-
Ameletus	-	-	-	-	-
Ephemera	-	-	-	-	-
Pseudocloeon	-	-	-	-	-
Undetermined Nymphules	-	-	-	-	-
	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	2	-	1	2	-
Cheumatopsyche	3	-	-	-	-
Hydropsychidae	-	-	1	1	-
Glossosoma	-	-	-	-	-
Brachycentrus	-	-	-	-	-
Oecetis	-	-	1	-	-
Psychomyia	-	-	-	-	-
Neureclipsis	-	-	-	-	-

SITE: Rundle Footbridge Left Bank
DATE: 29/9/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Ceraclea	-	-	-	-	-
Polycentropus	-	-	-	-	-
Leptoceridae	-	-	-	-	-
Neotrichia	-	-	-	-	-
Lepidostoma	-	-	-	-	-
Hydroptilidae	-	-	-	-	-
PLECOPTERA					
Isoperla	4	2	6	8	1
Alloperla	-	-	-	-	-
Isogenus	-	-	-	-	-
Taenionema	59	69	75	53	50
Perlodidae	-	-	-	-	-
Chloroperlidae	10	4	4	9	4
Capniidae	-	-	12	21	32
undetermined	4	-	-	-	-
COLLEMBOLA	1	-	-	1	-
ODONATA	-	-	-	-	-
HEMIPTERA					
Corixidae	161	114	71	32	65
COLEOPTERA					
Adults	1	3	2	2	2
Elmidae Larvae	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	8	4	8	4	-
Tanytarsini	4	8	-	4	-
Orthocladiinae	916	672	828	931	596
Tanypodinae	20	4	-	20	-
Pupae	40	24	23	8	-
Ceratopogonidae	-	-	-	-	-
Tipulidae	-	-	-	-	-
Ephydridae	-	-	-	-	-
Tabanidae	-	-	-	-	-
Rhagionidae	-	-	-	-	-
Empididae	2	-	2	-	-
Dolichopodidae	-	-	-	-	-
Simuliidae	-	-	-	-	-
Adult	12	-	4	10	7
ACARI	1	9	2	1	-
MOLLUSCA					
Physidae	-	-	-	-	-

SITE: **Rundle Footbridge Left Bank**
DATE: 29/9/82 Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Lymnaeidae	-	-	-	-	-
Planorbidae	-	-	-	-	-
Sphaeriidae	-	-	-	-	-
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-
Ancylidae	-	-	-	-	-
Ferrissia	-	-	2	1	-

RIVER: North Saskatchewan River
SITE: Rundle Footbridge Right Bank
DATE: 29/9/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
undetermined	5	-	32	-	16
Mermithoidea	1	24	-	16	-
TURBELLARIA	1	-	-	-	-
OLIGOCHAETA					
Tubificidae	102	168	68	1840	288
Naididae	31920	14584	28160	35136	20016
Enchytraeidae	2	8	-	-	-
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Gammarus	-	-	-	-	-
EPHEMEROPTERA					
Ephemerella	-	-	-	-	-
Baetis	-	-	-	-	-
Tricorythodes	1	-	-	3	-
Caenis	-	-	-	-	-
Rhithrogena	-	-	-	-	-
Heptagenia	-	-	-	-	-
Heptageniidae	-	-	-	-	-
Paraleptophlebia	-	-	-	-	-
Leptophlebia	-	-	-	-	-
Centroptilum	-	-	-	-	-
Parameletus	-	-	-	-	-
Stenonema	-	-	-	-	-
Ameletus	-	-	-	-	-
Ephemera	-	-	-	-	-
Pseudocloeon	-	-	-	-	-
undetermined Nymphules	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	-	-	-	1	-
Cheumatopsyche	-	-	-	-	-
Hydropsychidae	-	-	-	-	-
Glossosoma	-	-	-	-	-
Brachycentrus	-	-	-	-	-
Oecetis	-	-	-	-	-
Psychomyia	-	-	-	-	-
Neureclipsis	-	-	-	-	-

SITE: *Rundle Footbridge Right Bank*
DATE: 29/9/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Ceraclea	-	-	-	-	-
Polycentropus	-	-	-	-	-
Leptoceridae	-	-	-	-	-
Neotrichia	-	-	-	-	-
Lepidostoma	-	-	-	-	-
Hydroptilidae	-	-	-	-	-
PLECOPTERA					
Isoperla	-	-	-	-	-
Alloperla	-	-	-	-	-
Isogenus	-	-	-	-	-
Taenionema	-	-	-	-	-
Perlodidae	-	-	-	-	-
Chloroperlidae	2	-	-	1	-
Capniidae	-	-	-	-	-
Undetermined	-	-	-	-	-
COLLEMBOLA	-	-	-	-	-
ODONATA	-	-	-	-	-
HEMIPTERA					
Corixidae	4	-	2	1	4
COLEOPTERA					
Adults	-	-	-	-	-
Elmidae Larvae	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	7	8	8	-	-
Tanytarsini	1	-	-	-	-
Orthocladiinae	48	208	736	208	464
Tanypodinae	-	-	-	-	-
Pupae	4	8	48	34	39
Ceratopogonidae	1	1	-	-	-
Tipulidae	-	-	-	-	-
Ephydridae	-	-	-	-	-
Tabanidae	-	-	-	-	-
Rhagionidae	-	-	-	-	-
Empididae	-	-	-	-	-
Dolichopodidae	-	-	-	-	-
Simuliidae	-	-	-	-	-
Adult	-	-	-	6	8
Erioptera	1	1	-	-	-
ACARI	-	-	-	-	-
MOLLUSCA					
Physidae	-	-	-	-	-

SITE: Rundle Footbridge Right Bank
DATE: 29/9/82 Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Lymnaeidae	-	-	-	-	-
Planorbidae	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-
Ancylidae					
Ferrissia	-	-	-	-	-

RIVER: North Saskatchewan River
SITE: Beverly Bridge Left Bank
DATE: 1/10/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
undetermined	8	38	14	12	14
Mermithoidea	28	26	34	14	36
TURBELLARIA	-	-	-	1	-
OLIGOCHAETA					
Tubificidae	12	40	34	20	12
Naididae	1546	574	2006	1124	1712
Enchytraeidae	-	2	2	4	4
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Gammarus	-	-	-	-	-
EPHEMEROPTERA					
Ephemerella	34	7	9	5	7
Baetis	9	-	2	2	-
Tricorythodes	27	3	3	10	3
Caenis	1	-	-	-	-
Rhithrogena	-	-	-	-	-
Heptagenia	-	-	-	-	-
Heptageniidae	9	-	-	1	-
Paraleptophlebia	-	-	-	-	1
Leptophlebia	-	-	-	1	-
Centroptilum	-	-	-	-	-
Parameletus	-	-	-	-	-
Stenonema	-	-	-	-	-
Ameletus	-	-	-	-	-
Ephemera	-	-	-	-	-
Pseudocloeon	1	-	-	1	-
undetermined Nymphules	1	-	1	-	-
TRICHOPTERA					
Hydropsyche	3	-	-	-	-
Cheumatopsyche	-	-	-	-	-
Hydropsychidae	1	-	-	-	-
Glossosoma	-	-	-	-	-
Brachycentrus	1	-	-	-	-
Oecetis	-	-	-	-	-
Psychomyia	-	-	-	-	-
Neureclipsis	1	-	-	-	-

SITE: Beverly Bridge Left Bank
DATE: 1/10/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Ceraclea	-	-	-	-	-
Polycentropus	-	-	-	-	-
Leptoceridae	-	-	-	-	-
Neotrichia	-	-	-	-	-
Lepidostoma	-	-	-	-	-
Hydroptilidae	-	-	-	-	-
PLECOPTERA					
Isoperla	10	8	2	4	7
Alloperla	12	1	1	5	-
Isogenus	-	-	-	-	-
Taenionema	2	1	1	2	-
Perlodidae	-	-	-	-	-
Chloroperlidae	-	-	-	-	-
Capniidae	16	9	9	4	12
undetermined	-	-	-	-	-
COLLEMBOLA	-	-	-	-	-
ODONATA	-	-	-	-	-
HEMIPTERA					
Corixidae	21	15	29	8	21
COLEOPTERA					
Adults	1	2	2	-	2
Elmidae Larvae	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	6	14	6	8	8
Tanytarsini	8	-	-	2	-
Orthocladiinae	428	164	254	430	274
Tanypodinae	8	-	2	6	2
Pupae	2	4	8	16	10
Ceratopogonidae	-	-	-	-	-
Tipulidae	-	-	-	-	-
Ephydridae	-	-	-	-	-
Tabanidae	-	-	-	-	-
Rhagionidae	-	-	-	-	-
Empididae	1	-	-	-	-
Dolichopodidae	-	-	-	-	-
Simuliidae	-	-	-	-	-
Adult	6	3	2	1	4
ACARI	-	-	-	-	-
MOLLUSCA					
Physidae	-	-	-	-	-

SITE: **Beverly Bridge Left Bank**
DATE: 1/10/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Lymnaeidae	-	-	-	-	-
Planorbidae	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-
Ancylidae					
Ferrissia	3	1	3	3	7

RIVER: North Saskatchewan River Sorted By: B. Wright
SITE: Beverly Bridge Right Bank Counts and Identification: A. M. Anderson
DATE: 11/10/82

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
Undetermined	-	24	8	8	-
Mermithoidea	40	8	8	32	24
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	120	152	264	136	176
Naididae	6192	7112	9120	8752	7344
Enchytraeidae	8	-	8	-	-
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Gammarus	-	-	-	-	-
EPHEMEROPTERA					
Ephemerella	-	-	1	-	-
Baetis	-	-	-	-	-
Tricorythodes	9	3	4	3	4
Caenis	-	-	-	1	-
Rhithrogena	-	-	-	-	-
Heptagenia	-	-	-	-	-
Heptageniidae	-	-	-	-	-
Paraleptophlebia	-	-	-	-	-
Leptophlebia	-	-	-	-	-
Centroptilum	-	-	-	-	-
Parameletus	-	-	-	-	-
Stenonema	-	-	-	-	-
Ameletus	-	-	-	-	-
Ephemera	-	-	-	-	-
Pseudocloeon	-	-	-	-	-
Undetermined Nymphules	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	-	-	-	-	-
Cheumatopsyche	-	-	-	-	-
Hydropsychidae	-	-	-	-	-
Glossosoma	-	-	-	-	-
Brachycentrus	-	-	-	-	-
Oecetis	-	-	-	-	-
Psychomyia	-	-	-	-	-
Neureclipsis	-	-	-	-	-

SITE: North Saskatchewan River
DATE: Beverly Bridge Right Bank Continued
11/10/82

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Ceraclea	-	-	-	-	-
Polycentropus	-	-	-	-	-
Leptoceridae	1	-	-	-	-
Neotrichia	-	-	-	-	-
Lepidostoma	-	-	-	-	-
Hydroptilidae	-	-	-	-	-
PLECOPTERA					
Isoperla	1	1	-	-	-
Alloperla	-	-	-	-	-
Isogenus	-	-	-	-	-
Taenionema	-	-	-	-	-
Perlodidae	-	-	-	-	-
Chloroperlidae	-	-	-	-	-
Capniidae	1	-	-	1	-
undetermined	-	-	-	-	-
COLLEMBOLA	-	-	-	-	-
ODONATA	-	-	-	-	-
HEMIPTERA					
Corixidae	-	1	7	12	12
COLEOPTERA					
Adults	-	1	-	-	-
Elmidae Larvae	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	99	140	120	224	164
Tanytarsini	-	-	-	-	4
Orthocladiinae	184	184	168	304	160
Tanypodinae	4	16	16	-	4
Pupae	32	16	20	8	12
Ceratopogonidae	-	-	-	-	-
Tipulidae	-	-	-	-	-
Ephydridae	-	-	-	-	-
Tabanidae	-	-	-	-	-
Rhagionidae	-	-	-	-	-
Empididae	-	-	-	-	-
Dolichopodidae	-	-	-	-	-
Simuliidae	-	-	-	-	-
Adult	13	2	6	9	11
ACARI					
MOLLUSCA					
Physidae	-	-	-	-	-

SITE: **Beverly Bridge Right Bank**
DATE: 11/10/82 Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Lymnaeidae	-	-	4	-	-
Planorbidae	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-
Ancylidae					
Ferrissia	2	4	5	4	4

RIVER: North Saskatchewan River
SITE: Cloverdale Left Bank
DATE: 2/10/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	1	-	-	-	-
NEMATODA					
undetermined	20	16	24	-	12
Mermithoidea	12	16	4	12	-
TURBELLARIA					
OLIGOCHAETA					
Tubificidae	700	640	1088	264	352
Naididae	3584	4892	4212	1812	2452
Enchytraeidae	-	-	-	-	-
HIRUDINEA	-	-	-	1	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Gammarus	-	-	-	-	-
EPHEMEROPTERA					
Ephemerella	-	-	-	-	1
Baetis	2	-	-	-	-
Tricorythodes	1	-	-	-	-
Caenis	-	-	-	-	-
Rhithrogena	-	-	-	-	-
Heptagenia	-	-	-	-	-
Heptageniidae	-	-	-	-	-
Paraleptophlebia	-	-	-	-	-
Leptophlebia	-	-	-	-	-
Centroptilum	-	-	-	-	-
Parameletus	-	-	-	-	-
Stenonema	-	-	-	-	-
Ameletus	-	-	-	-	-
Ephemera	-	-	-	-	-
Pseudocloeon	-	-	-	-	-
undetermined Nymphules	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	-	-	-	-	-
Cheumatopsyche	-	-	-	-	-
Hydropsychidae	-	-	-	-	-
Glossosoma	-	2	-	-	-
Brachycentrus	-	-	-	-	-
Oecetis	-	-	-	-	-
Psychomyia	-	-	-	-	-
Neureclipsis	-	-	-	-	-

SITE: **Cloverdale Left Bank**
DATE: 2/10/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Ceraclea	-	-	-	-	-
Polycentropus	-	-	-	-	-
Leptoceridae	-	-	-	-	-
Neotrichia	-	-	-	-	-
Lepidostoma	-	-	-	-	-
Hydroptilidae	-	-	-	-	-
PLECOPTERA					
Isoperla	1	-	-	-	-
Alloperla	-	-	-	-	-
Isogenus	-	-	-	-	-
Taenionema	-	-	-	-	-
Perlodidae	-	-	-	-	-
Chloroperlidae	-	-	-	-	-
Capniidae	-	-	-	-	-
undetermined	-	-	-	-	-
COLLEMBOLA	-	1	-	-	-
ODONATA	-	-	-	-	-
HEMIPTERA					
Corixidae	10	6	6	4	11
COLEOPTERA					
Adults	-	1	1	-	1
Elmidae Larvae	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	-	-	-	-	-
Tanytarsini	-	-	-	-	-
Orthocladiinae	20	32	4	12	20
Tanypodinae	4	-	-	-	-
Pupae	-	-	-	-	4
Ceratopogonidae	-	-	-	-	-
Tipulidae	-	-	-	-	-
Ephydridae	-	1	-	-	-
Tabanidae	-	-	-	-	-
Rhagionidae	-	-	-	-	-
Empididae	-	-	1	-	-
Dolichopodidae	-	-	-	-	-
Simuliidae	-	-	-	-	-
Adult	18	3	4	-	2
ACARI	1	2	1	1	1
MOLLUSCA					
Physidae	-	-	-	-	-

SITE: **Cloverdale Left Bank**
DATE: 2/10/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Lymnaeidae	3	1	-	-	2
Planorbidae	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-
Ancylidae					
Ferrissia	15	28	20	3	10

RIVER: North Saskatchewan River
SITE: Cloverdale Right Bank
DATE: 1/10/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
undetermined	2	4	-	4	4
Mermithoidea	138	108	156	16	80
TURBELLARIA					
OLIGOCHAETA					
Tubificidae	14	46	28	28	16
Naididae	800	2022	3348	2316	2396
Enchytraeidae	-	-	-	-	-
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Gammarus	-	-	-	-	-
EPHEMEROPTERA					
Ephemerella	9	6	18	1	3
Baetis	45	33	51	-	17
Tricorythodes	33	53	72	1	9
Caenis	-	-	-	-	1
Rhithrogena	1	-	2	1	-
Heptagenia	8	-	6	-	-
Heptageniidae	1	-	2	-	-
Paraleptophlebia	-	1	-	-	-
Leptophlebia	-	1	-	-	-
Centroptilum	-	-	-	-	-
Parameletus	-	-	-	-	-
Stenonema	-	-	-	-	-
Ameletus	-	-	-	-	-
Ephemera	-	-	-	-	-
Pseudocloeon	-	-	6	-	-
undetermined Nymphules	-	-	1	-	-
TRICHOPTERA					
Hydropsyche	65	63	86	-	28
Cheumatopsyche	1	-	2	-	-
Hydropsychidae	-	4	3	-	-
Glossosoma	19	16	24	-	6
Brachycentrus	1	1	-	-	-
Oecetis	-	-	-	-	-
Psychomyia	-	3	3	2	1
Neureclipsis	-	-	-	-	-

SITE: Cloverdale Right Bank
DATE: 1/10/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Ceraclea	-	-	-	-	-
Polycentropus	-	-	-	-	-
Leptoceridae	-	-	-	-	-
Neotrichia	-	-	-	-	-
Lepidostoma	-	-	-	-	-
Hydroptilidae	-	-	-	-	-
PLECOPTERA					
Isoperla	1	1	3	-	2
Alloperla	-	-	2	-	-
Isogenus	-	-	-	-	-
Taenionema	-	-	-	-	-
Perlodidae	-	-	-	-	-
Chloroperlidae	-	-	-	-	-
Capniidae	10	4	5	2	1
Undetermined	7	5	9	3	-
COLLEMBOLA	-	-	-	-	-
ODONATA	-	-	-	-	-
HEMIPTERA					
Corixidae	18	12	19	72	7
COLEOPTERA					
Adults	-	-	-	-	-
Elmidae Larvae	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	18	88	72	32	40
Tanytarsini	2	-	4	4	-
Orthocladiinae	1290	1438	1068	460	1204
Tanypodinae	80	82	136	-	44
Pupae	72	57	48	36	28
Ceratopogonidae	-	-	-	-	-
Tipulidae	-	-	-	-	-
Ephydridae	-	-	-	-	-
Tabanidae	-	-	-	-	-
Rhagionidae	-	-	-	-	-
Empididae	2	1	1	-	-
Dolichopodidae	-	-	-	-	-
Simuliidae	-	-	-	-	-
Adult	22	21	22	59	6
ACARI	1	2	2	1	-
MOLLUSCA					
Physidae	2	2	2	-	-

SITE: **Cloverdale Right Bank**
DATE: 1/10/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Lymnaeidae	-	-	-	3	1
Planorbidae	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-
Ancylidae					
Ferrissia	31	75	41	330	34

RIVER: North Saskatchewan River Sorted By: B. Wright
SITE: Fort Saskatchewan Left Bank Counts and Identification: A. M. Anderson
DATE: 2/10/82

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	2	-	-	2	1
NEMATODA					
undetermined	52	20	32	40	24
Mermithoidea	396	164	492	436	172
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	452	28	304	76	836
Naididae	100	92	252	128	224
Enchytraeidae	-	-	-	-	-
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Gammarus	-	-	-	-	-
EPHEMEROPTERA					
Ephemerella	11	3	29	45	20
Baetis	-	2	-	3	2
Tricorythodes	19	7	81	56	118
Caenis	-	-	-	-	-
Rhithrogena	1	4	5	8	15
Heptagenia	5	-	7	8	68
Heptageniidae	3	-	1	5	2
Paraleptophlebia	-	-	-	-	-
Leptophlebia	-	-	1	-	-
Centroptilum	-	-	-	-	-
Parameletus	-	-	-	-	-
Stenonema	-	-	-	-	-
Ameletus	-	-	-	-	-
Ephemera	-	-	-	-	-
Pseudocloeon	-	-	-	-	-
undetermined Nymphules	-	-	-	1	1
TRICHOPTERA					
Hydropsyche	3	2	2	4	5
Cheumatopsyche	-	-	-	-	-
Hydropsychidae	1	-	-	3	1
Glossosoma	1	-	-	1	-
Brachycentrus	-	-	-	-	-
Oecetis	-	-	-	-	-
Psychomyia	-	-	-	-	-
Neureclipsis	-	-	-	-	-

SITE: Fort Saskatchewan Left Bank
DATE: 2/10/ 82 Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Ceraclea	-	-	-	-	-
Polycentropus	-	-	-	-	-
Leptoceridae	-	-	-	-	-
Neotrichia	-	-	-	-	-
Lepidostoma	-	-	-	-	-
Hydroptilidae	-	-	-	-	-
PLECOPTERA					
Isoperla	1	-	14	7	19
Alloperla	-	-	-	-	-
Isogenus	-	-	-	-	-
Taenionema	-	-	-	-	-
Perlodidae	-	-	-	-	-
Chloroperlidae	1	2	3	1	1
Capniidae	119	4	36	77	34
undetermined	-	-	-	-	-
COLLEMBOLA	-	-	-	1	-
ODONATA	-	-	-	-	-
HEMIPTERA					
Corixidae	25	11	30	35	41
COLEOPTERA					
Adults	-	-	-	-	-
Elmidae Larvae	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	20	-	4	12	24
Tanytarsini	4	-	8	-	-
Orthocladiinae	1700	700	1432	1860	1648
Tanypodinae	20	-	32	24	-
Pupae	57	24	88	80	148
Ceratopogonidae	1	-	-	-	-
Tipulidae	-	1	-	-	-
Ephydridae	-	-	-	-	-
Tabanidae	-	-	-	-	-
Rhagionidae	-	-	-	-	-
Empididae	-	-	-	2	1
Dolichopodidae	-	-	1	-	-
Simuliidae	-	-	-	-	-
Adult	7	41	4	9	4
ACARI					
MOLLUSCA					
Physidae	-	-	19	5	33

SITE: Fort Saskatchewan Left Bank
DATE: 2/10/82 Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Lymnaeidae	18	-	2	3	3
Planorbidae	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	1	-	1
Sphaerium	-	-	-	-	-
Ancylidae					
Ferrissia	83	11	120	18	87

RIVER: North Saskatchewan River Sorted By: B. Wright
SITE: Fort Saskatchewan Right Bank Counts and Identification: A. M. Anderson
DATE: 2/10/82

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	1	-	-	-	2
NEMATODA					
undetermined	4	4	8	24	-
Mermithoidea	132	84	292	196	164
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	872	1268	1732	920	2368
Naididae	13744	6980	2752	1000	3564
Enchytraeidae	-	-	-	-	-
HIRUDINEA	-	3	-	-	1
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Gammarus	-	-	-	-	-
EPHEMEROPTERA					
Ephemerella	4	3	17	50	35
Baetis	-	-	3	4	1
Tricorythodes	3	7	23	103	49
Caenis	-	-	-	-	1
Rhithrogena	-	-	2	1	4
Heptagenia	1	6	16	2	10
Heptageniidae	1	1	1	1	-
Paraleptophlebia	-	-	-	-	1
Leptophlebia	2	-	7	-	4
Centroptilum	-	-	-	-	-
Parameletus	-	-	-	-	-
Stenonema	-	-	-	-	-
Ameletus	-	-	-	-	-
Ephemera	-	-	-	-	-
Pseudocloeon	-	-	-	-	-
undetermined Nymphules	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	1	7	50	100	83
Cheumatopsyche	-	-	-	-	-
Hydropsychidae	-	-	3	4	-
Glossosoma	2	2	3	-	1
Brachycentrus	-	-	-	-	-
Oecetis	-	-	-	-	-
Psychomyia	-	-	1	-	-
Neureclipsis	-	-	-	-	-

SITE: Fort Saskatchewan Right Bank Continued
DATE: 2/10/82

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Ceraclea	-	-	-	-	-
Polycentropus	-	-	-	-	-
Leptoceridae	-	-	-	-	-
Neotrichia	-	-	-	-	-
Lepidostoma	-	-	-	-	-
Hydroptilidae	-	-	-	-	-
PLECOPTERA					
Isoperla	3	6	27	14	19
Alloperla	-	-	-	2	4
Isogenus	-	-	-	-	-
Taenionema	-	-	-	-	-
Perlodidae	-	-	-	-	-
Chloroperlidae	-	-	-	-	-
Capniidae	-	1	13	7	24
undetermined	-	-	1	-	-
COLLEMBOLA	-	-	-	-	-
ODONATA	-	-	-	-	-
HEMIPTERA					
Corixidae	221	246	210	199	184
COLEOPTERA					
Adults	-	4	7	2	4
Elmidae Larvae	-	-	-	1	-
DIPTERA					
Chironomidae					
Chironomini	32	32	24	32	32
Tanytarsini	-	24	32	-	-
Orthocladiinae	224	584	604	1084	892
Tanypodinae	-	-	4	24	128
Pupae	-	8	8	24	8
Ceratopogonidae	-	-	-	-	-
Tipulidae	-	-	-	-	-
Ephydridae	-	-	-	-	-
Tabanidae	-	-	1	-	-
Rhagionidae	-	-	-	-	-
Empididae	-	-	-	-	-
Dolichopodidae	-	-	-	-	-
Simuliidae	-	-	-	-	-
Adult	10	8	6	3	-
ACARI	1	-	-	3	-
MOLLUSCA					
Physidae	-	-	-	-	-

SITE: Fort Saskatchewan Right Bank
DATE: 2/10/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Lymnaeidae	-	-	1	-	-
Planorbidae	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-
Ancylidae					
Ferrissia	16	21	50	31	27

RIVER: North Saskatchewan River
SITE: Sturgeon Left Bank
DATE: 2/10/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	1	-	-	-	-
NEMATODA					
undetermined	44	52	52	40	20
Mermithoidea	44	48	32	44	20
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	520	260	916	1000	708
Naididae	28	12	72	16	64
Enchytraeidae	-	-	-	-	-
HIRUDINEA	8	4	-	5	2
CRUSTACEA					
Amphipoda					
Hyalella	10	14	45	4	13
Gammarus	-	-	6	-	1
EPHEMEROPTERA					
Ephemerella	-	1	2	-	3
Baetis	1	2	-	-	2
Tricorythodes	4	11	75	3	6
Caenis	-	-	15	1	2
Rhithrogena	-	-	1	-	1
Heptagenia	4	4	33	1	17
Heptageniidae	-	-	5	1	1
Paraleptophlebia	-	-	-	-	-
Leptophlebia	2	2	2	-	1
Centroptilum	-	-	-	-	-
Parameletus	-	-	-	-	-
Stenonema	-	-	1	-	-
Ameletus	-	-	-	-	-
Ephemera	-	-	-	-	-
Pseudocloeon	-	-	-	-	-
undetermined Nymphules	-	-	1	-	-
TRICHOPTERA					
Hydropsyche	-	2	4	-	8
Cheumatopsyche	-	1	-	-	-
Hydropsychidae	-	-	-	-	-
Glossosoma	-	-	-	-	-
Brachycentrus	-	-	-	-	-
Oecetis	-	-	-	-	-
Psychomyia	-	-	6	-	1
Neureclipsis	-	-	3	-	5

SITE: Sturgeon Left Bank
DATE: 2/10/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Ceraclea	1	4	5	-	2
Polycentropus	-	-	-	-	-
Leptoceridae	-	-	-	-	-
Neotrichia	-	-	-	-	-
Lepidostoma	-	-	-	-	-
Hydroptilidae	-	-	-	-	-
PLECOPTERA					
Isoperla	2	2	9	1	4
Alloperla	-	-	-	-	-
Isogenus	-	-	-	-	-
Taenionema	-	-	4	1	1
Perlodidae	-	-	-	-	-
Chloroperlidae	-	-	-	-	-
Capniidae	8	10	12	3	4
undetermined	-	-	-	-	-
COLLEMBOLA	1	12	1	4	-
ODONATA	-	-	-	1	-
HEMIPTERA					
Corixidae	33	68	77	36	61
COLEOPTERA					
Adults	12	20	3	9	23
Elmidae Larvae	13	34	32	11	14
DIPTERA					
Chironomidae					
Chironomini	16	40	84	8	20
Tanytarsini	16	28	8	80	16
Orthocladiinae	196	204	376	84	328
Tanypodinae	8	12	16	-	16
Pupae	1	5	-	-	-
Ceratopogonidae	-	-	1	-	-
Tipulidae	-	-	-	-	-
Ephydridae	-	-	-	-	-
Tabanidae	-	-	-	-	-
Rhagionidae	-	-	-	-	-
Empididae	-	1	-	-	-
Dolichopodidae	-	-	-	-	-
Simuliidae	-	-	-	-	-
Adult	6	31	3	20	5
ACARI	-	-	-	-	-
MOLLUSCA					
Physidae	-	-	-	-	-

SITE: **Sturgeon Left Bank**
DATE: 2/10/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Lymnaeidae	-	-	3	-	2
Planorbidae					
Sphaeriidae					
Pisidium	1	8	29	17	5
Sphaerium	-	1	2	-	1
Ancylidae					
Ferrissia	40	30	171	24	76

RIVER: **North Saskatchewan River**
SITE: **Sturgeon Right Bank**
DATE: 2/10/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
undetermined	4	28	-	8	16
Mermithoidea	88	52	16	72	104
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	980	984	992	1788	1912
Naididae	368	284	536	600	5872
Enchytraeidae	-	4	-	-	-
HIRUDINEA	1	1	-	12	1
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Gammarus	-	-	-	-	-
EPHEMEROPTERA					
Ephemerella	7	4	10	8	-
Baetis	5	4	22	4	-
Tricorythodes	60	80	82	80	4
Caenis	-	-	-	2	-
Rhithrogena	1	-	2	2	-
Heptagenia	8	30	16	2	3
Heptageniidae	-	-	-	2	-
Paraleptophlebia	-	-	-	-	-
Leptophlebia	-	1	-	-	3
Centroptilum	-	-	-	-	-
Parameletus	-	-	-	-	-
Stenonema	-	-	-	-	-
Ameletus	-	-	-	-	-
Ephemera	-	-	-	-	-
Pseudocloeon	-	-	-	-	-
undetermined Nymphules	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	152	184	150	154	-
Cheumatopsyche	3	-	-	4	-
Hydropsychidae	-	2	-	-	1
Glossosoma	-	-	-	4	-
Brachycentrus	-	-	-	-	-
Oecetis	-	-	-	-	-
Psychomyia	-	-	2	2	-
Neureclipsis	-	-	-	-	-

SITE: **Sturgeon Right Bank**
DATE: 2/10/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Ceraclea	-	-	-	-	-
Polycentropus	-	-	-	-	-
Leptoceridae	-	-	-	-	-
Neotrichia	-	-	-	-	-
Lepidostoma	-	-	-	-	-
Hydroptilidae	-	-	-	-	-
PLECOPTERA					
Isoperla	12	10	10	12	-
Alloperla	-	-	-	-	-
Isogenus	-	-	-	-	-
Taenionema	-	-	-	-	-
Perlodidae	-	-	-	-	-
Chloroperlidae	-	-	-	-	-
Capniidae	35	24	26	42	-
undetermined	-	-	-	-	-
COLLEMBOLA	1	-	-	-	1
ODONATA	-	-	-	-	-
HEMIPTERA					
Corixidae	92	112	112	112	104
COLEOPTERA					
Adults	1	-	-	-	12
Elmidae Larvae	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	40	76	76	48	24
Tanytarsini	4	4	-	-	8
Orthocladiinae	588	732	640	1008	456
Tanypodinae	88	56	64	60	24
Pupae	4	8	-	4	20
Ceratopogonidae	-	-	-	-	-
Tipulidae					
Ephydridae	-	-	-	-	-
Tabanidae	-	2	-	-	-
Rhagionidae	-	-	-	-	-
Empididae	-	-	-	-	-
Dolichopodidae	-	-	-	-	-
Simuliidae	-	-	-	-	-
Adult	1	4	2	2	6
Erioptera	-	-	-	-	2
ACARI					
MOLLUSCA					
Physidae	-	-	-	-	-

SITE: **Sturgeon Right Bank**
DATE: 2/10/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Lymnaeidae	-	-	-	-	2
Planorbidae	-	-	-	-	-
Sphaeriidae					
Pisidium	4	-	10	4	4
Sphaerium	-	-	-	-	-
Ancylidae					
Ferrissia	5	10	20	50	28

RIVER: North Saskatchewan River
SITE: Vinca Bridge Left Bank
DATE: 24/9/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
undetermined	-	-	-	-	4
Mermithoidea	50	42	36	42	46
TURBELLARIA					
OLIGOCHAETA					
Tubificidae	318	638	332	654	56
Naididae	6	6	10	6	6
Enchytraeidae	-	-	-	-	-
HIRUDINEA	-	-	-	-	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Gammarus	-	-	-	-	-
EPHEMEROPTERA					
Ephemerella	8	76	88	68	54
Baetis	-	44	8	8	40
Tricorythodes	320	220	460	244	272
Caenis	-	-	-	-	-
Rhithrogena	-	-	4	-	-
Heptagenia	20	44	60	20	68
Heptageniidae	4	-	32	-	12
Paraleptophlebia	-	-	-	-	-
Leptophlebia	-	-	-	-	-
Centroptilum	-	-	-	-	-
Parameletus	-	-	-	-	-
Stenonema	-	-	-	-	-
Ameletus	-	-	-	-	-
Ephemera	-	-	-	-	-
Pseudocloeon	-	-	-	-	-
Undetermined Nymphules	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	84	368	264	124	380
Cheumatopsyche	-	8	8	-	20
Hydropsychidae	8	5	12	-	8
Glossosoma	-	-	-	-	-
Brachycentrus	-	1	-	-	4
Oecetis	-	-	-	-	-
Psychomyia	28	28	20	12	44
Neureclipsis	-	-	-	-	4

SITE: **Vinca Bridge Left Bank**
DATE: 24/9/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Ceraclea	-	-	-	-	-
Polycentropus	-	-	-	-	-
Leptoceridae	-	-	-	-	-
Neotrichia	-	-	-	-	-
Lepidostoma	-	-	-	-	-
Hydroptilidae	-	-	-	-	-
PLECOPTERA					
Isoperla	12	20	20	8	12
Alloperla	-	-	4	9	8
Isogenus	-	-	-	-	-
Taenionema	-	-	-	-	-
Perlodidae	-	-	-	-	-
Chloroperlidae	-	-	-	-	-
Capniidae	-	-	4	-	8
undetermined	-	-	-	4	-
COLLEMBOLA	-	-	-	-	-
ODONATA	-	-	-	-	-
HEMIPTERA					
Corixidae	628	180	208	452	116
COLEOPTERA					
Adults	-	1	-	-	-
Elmidae Larvae	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	578	114	60	78	112
Tanytarsini	2	4	10	2	8
Orthocladiinae	476	652	500	618	848
Tanypodinae	92	198	118	96	376
Pupae	6	8	-	6	4
Ceratopogonidae	4	-	-	-	1
Tipulidae	-	-	-	-	-
Ephydridae	-	-	-	-	-
Tabanidae	-	-	-	-	-
Rhagionidae	-	-	-	-	-
Empididae	-	2	12	-	10
Dolichopodidae	-	-	-	-	-
Simuliidae	-	-	-	-	-
Adult	8	-	4	-	10
ACARI	4	-	-	4	8
MOLLUSCA					
Physidae	-	-	-	-	-

SITE: Vinca Bridge Left Bank
DATE: 24/9/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Lymnaeidae	-	-	-	-	-
Planorbidae	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	4	-	-
Sphaerium	-	-	-	-	-
Ancylidae					
Ferrissia	-	-	-	-	-

RIVER: North Saskatchewan River
SITE: Vinca Bridge Right Bank
DATE: 24/9/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	6	3	1	4	-
NEMATODA					
undetermined	24	-	4	8	12
Mermithoidea	66	28	28	40	48
TURBELLARIA					
OLIGOCHAETA					
Tubificidae	260	392	176	244	392
Naididae	572	496	812	516	324
Enchytraeidae	-	-	-	-	-
HIRUDINEA	1	-	-	1	-
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	1	-
Gammarus	-	-	-	-	-
EPHEMEROPTERA					
Ephemerella	11	11	5	4	3
Baetis	-	-	-	1	1
Tricorythodes	65	78	53	56	51
Caenis	-	-	-	-	-
Rhithrogena	-	-	-	-	-
Heptagenia	7	4	3	13	2
Heptageniidae	-	-	-	1	-
Paraleptophlebia	-	-	-	-	-
Leptophlebia	-	-	-	-	-
Centroptilum	-	-	-	-	-
Parameletus	-	-	-	-	-
Stenonema	-	-	-	-	-
Ameletus	-	-	-	-	-
Ephemera	-	-	-	-	-
Pseudocloeon	-	-	-	-	-
undetermined Nymphules	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	31	39	11	22	18
Cheumatopsyche	1	-	1	-	-
Hydropsychidae	1	1	-	-	1
Glossosoma	-	3	1	-	1
Brachycentrus	-	-	-	-	-
Oecetis	-	-	-	-	-
Psychomyia	8	15	3	15	6
Neureclipsis	-	-	-	-	-

SITE: **Vinca Bridge Right Bank**
DATE: 24/9/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Ceraclea	-	-	-	-	-
Polycentropus	-	-	-	-	-
Leptoceridae	-	-	-	-	1
Neotrichia	-	-	-	-	-
Lepidostoma	-	-	-	-	-
Hydroptilidae	-	-	-	-	-
PLECOPTERA					
Isoperla	1	-	1	1	1
Alloperla	-	-	-	-	-
Isogenus	-	-	-	-	-
Taenionema	-	-	-	-	-
Perlodidae	-	-	-	-	-
Chloroperlidae	-	-	-	-	-
Capniidae	3	4	-	3	1
undetermined	-	-	-	-	-
COLLEMBOLA	-	-	-	-	-
ODONATA	-	-	-	-	-
HEMIPTERA					
Corixidae	8	19	14	27	14
COLEOPTERA					
Adults	-	1	-	-	-
Elmidae Larvae	-	1	2	-	-
DIPTERA					
Chironomidae					
Chironomini	204	236	312	236	132
Tanytarsini	20	8	4	10	8
Orthocladiinae	650	772	452	708	712
Tanypodinae	46	80	28	28	8
Pupae	45	46	12	48	72
Ceratopogonidae	-	-	1	-	-
Tipulidae	-	-	-	-	-
Ephydridae	-	-	-	-	-
Tabanidae	-	-	-	-	-
Rhagionidae	-	-	1	-	-
Empididae	1	2	-	1	2
Dolichopodidae	-	-	-	-	-
Simuliidae	-	-	-	-	-
Adult	3	-	7	-	1
ACARI	-	-	1	1	-
MOLLUSCA					
Physidae	-	-	-	-	-

SITE: Vinca Bridge Right Bank
DATE: 24/9/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Lymnaeidae	-	-	-	1	-
Planorbidae	-	-	-	-	-
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	1	-	-
Ancylidae					
Ferrissia	3	2	1	2	-

RIVER: North Saskatchewan River
SITE: Pakan Bridge Left Bank
DATE: 24/9/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	12	20	32	64	8
NEMATODA					
undetermined	-	-	4	-	4
Mermithoidea	4	20	40	32	52
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	80	164	124	116	160
Naididae	100	60	80	252	120
Enchytraeidae	-	-	-	-	-
HIRUDINEA	-	-	-	-	1
CRUSTACEA					
Amphipoda					
Hyalella	-	-	-	-	-
Gammarus	-	-	-	-	-
EPHEMEROPTERA					
Ephemerella	204	212	44	156	44
Baetis	16	28	4	12	8
Tricorythodes	236	796	240	456	276
Caenis	-	-	-	-	-
Rhithrogena	-	-	-	-	-
Heptagenia	28	124	68	172	76
Heptageniidae	12	-	4	4	12
Paraleptophlebia	-	-	-	-	-
Leptophlebia	-	-	-	-	-
Centroptilum	-	-	-	-	-
Parameletus	-	-	-	-	-
Stenonema	-	-	-	-	-
Ameletus	-	-	-	-	-
Ephemera	-	-	-	-	-
Pseudocloeon	-	-	-	-	-
undetermined Nymphules	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	96	16	4	128	8
Cheumatopsyche	4	-	4	8	-
Hydropsychidae	12	-	-	4	-
Glossosoma	-	-	-	-	-
Brachycentrus	-	-	-	-	-
Oecetis	-	-	4	-	-
Psychomyia	24	4	-	4	4
Neureclipsis	-	-	-	-	-

SITE: **Pakan Bridge Left Bank**
DATE: 24/9/82 Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Ceraclea	-	-	-	-	-
Polycentropus	-	-	-	-	-
Leptoceridae	-	-	-	-	-
Neotrichia	-	-	-	-	-
Lepidostoma	-	-	-	-	-
Hydroptilidae	-	-	-	-	-
PLECOPTERA					
Isoperla	56	92	12	52	28
Alloperla	-	24	4	20	4
Isogenus	-	-	-	-	-
Taenionema	-	-	-	-	-
Perlodidae	-	-	-	-	-
Chloroperlidae	-	-	-	-	-
Capniidae	-	-	8	-	4
Undetermined	-	-	-	-	-
COLLEMBOLA	-	-	-	-	-
ODONATA	-	-	-	-	-
HEMIPTERA					
Corixidae	72	220	120	12	60
COLEOPTERA					
Adults	-	-	-	-	-
Elmidae Larvae	-	-	-	-	-
DIPTERA					
Chironomidae	32	160	320	60	216
Chironomini	24	108	24	28	28
Tanytarsini	832	820	692	656	1104
Orthocladiinae	52	20	12	88	16
Tanypodinae	36	36	24	40	56
Pupae	-	-	-	-	-
Ceratopogonidae	-	-	-	-	-
Tipulidae	-	-	-	-	-
Ephydridae	-	-	-	-	-
Tabanidae	-	-	-	-	-
Rhagionidae	-	-	-	-	-
Empididae	-	-	-	-	-
Dolichopodidae	-	-	-	-	-
Simuliidae	-	-	-	-	-
Adult	-	8	-	-	-
ACARI					
MOLLUSCA					
Physidae	-	4	-	-	-

SITE: Pakan Bridge Left Bank
DATE: 24/9/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Lymnaeidae	-	-	-	-	-
Planorbidae	-	-	-	-	1
Sphaeriidae					
Pisidium	-	-	-	-	-
Sphaerium	-	-	-	-	-
Ancylidae					
Ferrissia	20	4	-	-	28

RIVER: North Saskatchewan River
SITE: Pakan Right Bank
DATE: 24/9/82

Sorted By: B. Wright
Counts and Identification: A. M. Anderson

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
COELENTERATA					
Hydrozoa	-	-	-	-	-
NEMATODA					
undetermined	4	-	4	-	-
Mermithoidea	96	12	24	48	16
TURBELLARIA	-	-	-	-	-
OLIGOCHAETA					
Tubificidae	100	336	160	512	132
Naididae	88	168	132	64	116
Enchytraeidae	-	-	-	-	-
HIRUDINEA	-	1	2	-	-
CRUSTACEA					
Amphipoda					
Hyalella	4	1	1	-	-
Gammarus	-	-	-	-	-
EPHEMEROPTERA					
Ephemerella	132	24	80	44	12
Baetis	44	12	36	4	-
Tricorythodes	664	208	384	656	128
Caenis	-	-	~~1~~	-	-
Rhithrogena	-	-	-	-	-
Heptagenia	104	12	152	108	12
Heptageniidae	-	-	4	20	-
Paraleptophlebia	-	-	-	-	-
Leptophlebia	-	-	-	3	-
Centroptilum	-	-	-	-	-
Parameletus	-	-	-	-	-
Stenonema	-	-	-	-	-
Ameletus	-	-	-	-	-
Ephemera	-	-	-	-	-
Pseudocloeon	-	-	-	-	-
undetermined Nymphules	-	-	-	-	-
TRICHOPTERA					
Hydropsyche	44	4	12	-	-
Cheumatopsyche	-	-	4	4	-
Hydropsychidae	8	-	-	4	-
Glossosoma	4	-	4	-	-
Brachycentrus	-	-	-	-	-
Oecetis	-	-	-	-	-
Psychomyia	4	4	12	16	8
Neureclipsis	8	-	8	8	-

SITE: **Pakan Right Bank**
DATE: 24/9/82

Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Ceraclea	-	-	-	-	-
Polycentropus	-	-	-	-	-
Leptoceridae	-	-	-	-	-
Neotrichia	-	-	-	-	-
Lepidostoma	-	-	-	-	-
Hydroptilidae	-	-	-	-	-
PLECOPTERA					
Isoperla	44	20	20	40	-
Alloperla	-	4	4	-	-
Isogenus	-	-	-	-	-
Taenionema	4	-	-	-	-
Perlodidae	-	-	-	-	-
Chloroperlidae	-	-	-	-	-
Capniidae	-	-	4	4	-
undetermined	-	-	-	-	-
COLLEMBOLA	-	-	-	-	-
ODONATA	-	1	-	-	-
HEMIPTERA					
Corixidae	2600	1600	1240	3200	1600
COLEOPTERA					
Adults	4	-	-	1	-
Elmidae Larvae	-	-	-	-	-
DIPTERA					
Chironomidae					
Chironomini	116	96	68	356	92
Tanytarsini	12	4	20	12	4
Orthocladiinae	580	360	372	340	232
Tanypodinae	88	20	36	136	16
Pupae	32	36	16	40	28
Ceratopogonidae	-	-	-	-	-
Tipulidae	-	-	-	-	-
Ephydridae	-	-	-	-	-
Tabanidae	-	-	-	1	-
Rhagionidae	-	-	-	-	-
Empididae	8	-	4	16	-
Dolichopodidae	-	-	-	-	-
Simuliidae	-	-	-	-	-
Adult	4	24	12	4	12
ACARI	-	-	4	-	-
MOLLUSCA					
Physidae	-	-	-	1	-

SITE: Pakan Right Bank
DATE: 24/9/82 Continued

	REP.#1	REP.#2	REP.#3	REP.#4	REP.#5
Lymnaeidae	-	-	-	-	-
Planorbidae	-	-	-	-	-
Sphaeriidae					
Pisidium	4	-	-	-	-
Sphaerium	-	-	-	-	-
Ancylidae					
Ferrissia	4	4	12	4	8

CA2ALEN 18
86N57
Pt4 c.1

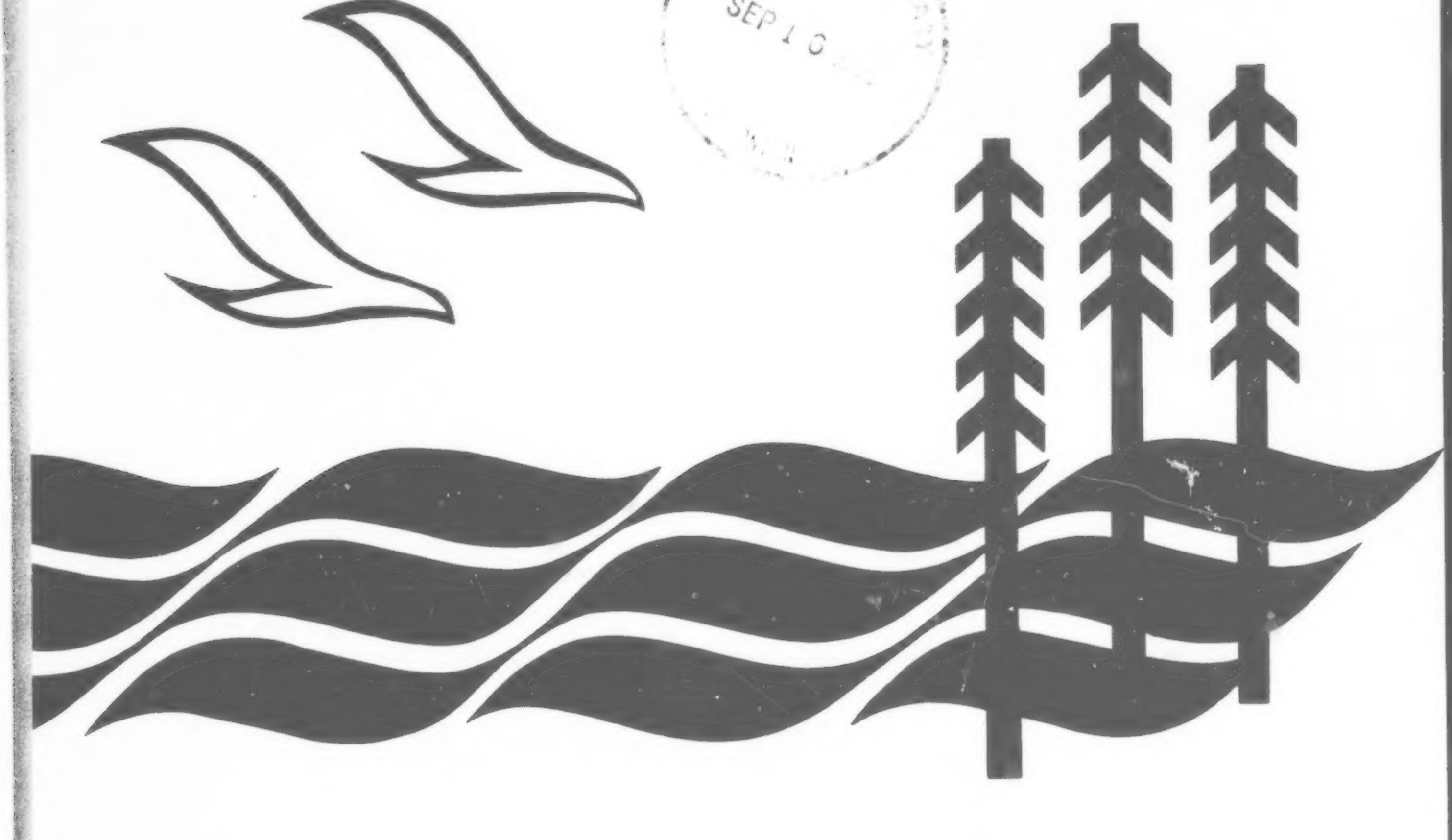
North Saskatchewan River

Characterization of Water Quality in the Vicinity of Edmonton (1982-83)

Overview

Sessional Paper No. 572/86
1 Session, 21 Legislature

LEGISLATURE LIBRARY
SEP 10



Alberta

ENVIRONMENT
Environmental Protection Services
Pollution Control Division
Water Quality Control Branch

NORTH SASKATCHEWAN RIVER: CHARACTERIZATION OF WATER QUALITY IN THE VICINITY OF EDMONTON

(1982 - 1983)

OVERVIEW

Prepared by: P.A. Mitchell, M.Sc.
R.S. Anderson, Ph.D.
A.M. Anderson, Ph.D.
A.M. Akena, Ph.D.
J.S. Livingstone, B.Sc.
A. Masuda, B.Sc., P.Eng.
T.B. Reynoldson, Ph.D.
D.O. Trew, B.Sc.
M. Vukadinovic, B.Sc., P.Eng.

Water Quality Control Branch
Pollution Control Division
Environmental Protection Services
Alberta Environment
Edmonton, Alberta

June 1986

TABLE OF CONTENTS

Page

INTRODUCTION 1

- Water Quality Assessment 2
- Study Design 3
- Potential Sources of Pollution to the River 7
- River Flow and Water Use 8

RESULTS OF THE STUDY 10

- Temperature 10
- Dissolved Oxygen 10
- Major Ions 10
- Non-filterable Residues 10
- Metals 11
- Organic Compounds 12
- Nutrients 13
- Chlorophyll a 13
- Carbon 14
- Bacteria 14
- Biochemical Oxygen Demand 15
- Zoobenthos 15

CONCLUSIONS 19

- Historical Perspective 19
- Characterization 19
- Alberta Surface Water Quality Objectives 20
- Impacts 20
- Uses of the River 20

INTRODUCTION

The North Saskatchewan River is a major tributary of the Saskatchewan-Nelson river system, which drains a large part of Alberta, Saskatchewan, Manitoba, and the state of North Dakota. From its source, the Saskatchewan Glacier on the Alberta-British Columbia border, the North Saskatchewan River flows eastward across central Alberta and into Saskatchewan where it joins the South Saskatchewan River east of Prince Albert to form the Saskatchewan River. The Saskatchewan River flows into Cedar Lake and then Lake Winnipeg in Manitoba, eventually draining into Hudson Bay through the Nelson River.

Historically, the North Saskatchewan River was an important transportation and communication route, and several early settlements were established along its banks. Many of these settlements have grown into regional population centres, among which Edmonton is the largest. These centres are dependent on the river as a source of water for domestic, agricultural, and industrial purposes, and as the receiving water for various domestic and industrial wastewater effluents. Population growth in the past 50 years has increased agricultural and industrial activities in the North Saskatchewan drainage basin. The river and its valley have also become the focus of many recreational activities and aesthetic interests. More recently, dams have altered the river's flow.

These human activities, as well as climatic variations, resulted in fluctuations in both the quantity and quality of water in the North Saskatchewan River. Public interest in environmental problems has in part led to improved treatment of municipal and industrial waste waters, and water quality in the river has improved greatly since the 1950's. Yet, people generally believe that water quality in the North Saskatchewan River is poor.

In 1982-83, the Water Quality Control Branch, Pollution Control Division, of Alberta Environment undertook a study to update and upgrade water quality data for a 100 kilometre stretch of the North Saskatchewan River from

Devon, upstream of the City of Edmonton, to Pakan bridge, well downstream of impacts within the metropolitan area. The objectives of the study were:

1. To characterize water quality through the study section by assessing bank-to-bank, upstream-downstream and seasonal trends.
2. To compare North Saskatchewan River water quality data with the Alberta Surface Water Quality Objectives.
3. To assess the impact of the city on the river.

The results of the study are published in a three-volume technical report entitled "North Saskatchewan River: Characterization of Water Quality in the Vicinity of Edmonton (1982-1983)." Part I includes an introduction, an assessment of water chemistry, bacteriology and the quantity of algae growing in the water and on rocks; Part II deals with the zoobenthos, or bottom-dwelling organisms; and Part III is a compendium of data upon which the other two volumes are based. Copies of these three volumes are available from the Water Quality Control Branch, Pollution Control Division, Alberta Environment.

This overview provides a non-technical summary of the study design, major findings and the conclusions presented in the main report.

Water Quality Assessment

The study was designed to answer a number of questions about water quality in the North Saskatchewan River. For example, how do the chemistry and biology of the river vary over the seasons and within the section under study? How does present water quality compare to Alberta Surface Water Quality Objectives? How do urban development and other impacts affect water quality in the river? A final question is, how are uses of the river affected downstream of urban impacts?

Sampling a storm sewer.

The sampling program was not designed to address people's concerns about the quality of their drinking water. Many substances are removed from water when it is treated for drinking, so that the chemistry of the water in the river is quite different than that which flows from a residential tap. Additionally, most of the impacts discussed in this document occur downstream of water supply intakes. Readers should not confuse river water quality with drinking water quality.

The provincial guidelines called the Alberta Surface Water Quality Objectives were established to protect water for various uses, such as drinking, swimming, agriculture, and propagation of fish and other aquatic life. The establishment of an objective level for a particular substance implies that when this level is exceeded, the use of the water may be impaired or that additional treatment may be needed. These objectives, or other similar published guidelines, aid in assessing water quality in the river.

The impact of urban development was assessed by comparing measured concentrations of constituents to the Alberta Surface Water Quality Objectives, and by comparing water quality at downstream sites with that from upstream sites.

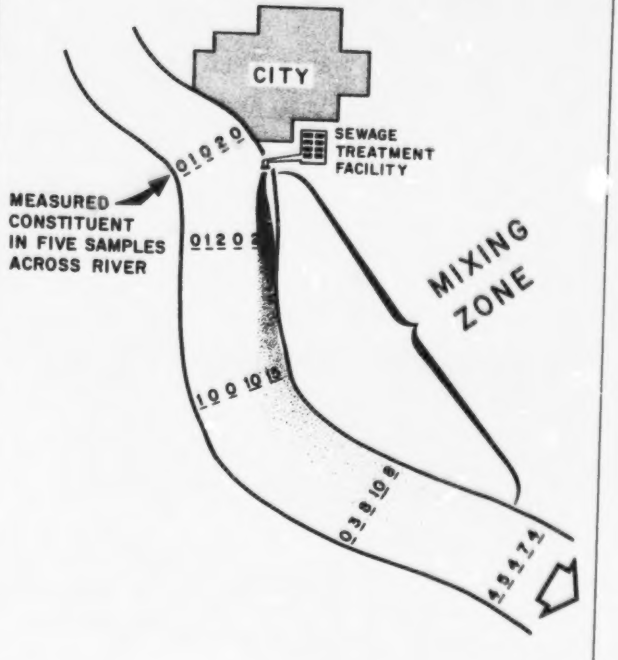

CITY
SEWAGE TREATMENT FACILITY
MEASURED CONSTITUENT IN FIVE SAMPLES ACROSS RIVER
MIXING ZONE
0 1 0 2 0
0 1 2 0 2
1 0 0 10 15
0 3 8 10 8
4 5 4 7 4

FIGURE 1 **Diagram of mixing of an effluent into the river flow. The numbers across the river represent concentrations of a hypothetical substance in five separate samples at each location.**

It is generally accepted that the Alberta Surface Water Quality Objectives cannot be applied strictly to water collected immediately downstream of an effluent plume. Thus, the mixing characteristics of the river are also important in assessing water quality. For example, the impact of an effluent may occur only along one bank of the river for many kilometres downstream (see Figure 1). Turbulence and bends in the river gradually mix the effluent into the channel flow. This was taken into consideration during the study by sampling near each bank and in the centre of the river channel. At the most downstream sampling location, Pakan Bridge south of Smoky Lake, the river is considered to be completely mixed most of the time.

Study Design

Three major components of the river ecosystem were identified as requiring study: the water itself, including substances dissolved or suspended in it; the sediments of the river bottom; and the plant and animal life within the water and the sediments. Much of the effort in sampling the river went toward the water component, because it is usually the focus of public concern. In addition to sampling the North Saskatchewan River, point-source contributions to the river were also monitored. These include major tributaries, such as the Redwater River and the Sturgeon River, industrial effluents and municipal sewage treatment plant effluents (Table 1).

Sampling locations on the river were chosen to represent three zones of impact: 1) upstream of the city, considered to be relatively unimpacted, 2) within and immediately downstream of the city, and 3) far enough downstream to show some evidence of "recovery." At each sampling location, samples were collected from the centre of the channel and from sites near the right and left banks (as determined by looking downstream). Figure 2 shows the sampling locations and the locations of major municipal and industrial facilities.

The river was sampled approximately biweekly during each field season. In 1982, samples were collected twelve times between mid-May and early November; in 1983, they were collected ten times between the third week in May and mid-November. Samples were also collected in February and March, 1984.

At each sampling location, water was collected for analysis of chemical constituents such as major ions, metals, and nutrients; organics and biological components such as chlorophyll, which estimates river algae, and indictor bacteria (see listing, Table 2).

Table 1.

MUNICIPAL SEWAGE AND INDUSTRIAL EFFLUENTS ENTERING THE NORTH SASKATCHEWAN RIVER DIRECTLY OR INDIRECTLY IN THE VICINITY OF EDMONTON CITY.

M 1. THORSBY
M 2. CALMAR
M 3. DEVON SEWAGE TREATMENT PLANT
M 4. INTERNATIONAL AIRPORT
M 5. LEDUC
M 6. NEW SAREPTA
M 7. BEAUMONT
M 8. NISKU
M 9. GOLD BAR WASTEWATER TREATMENT PLANT (GBWTP), EDMONTON
M10. BREMNER SEWAGE LAGOONS
M11. ST. ALBERT SEWAGE LAGOONS
M12. ARDROSSAN
M13. FORT SASKATCHEWAN
M14. ONOWAY
M15. STONY PLAIN
M16. PARKLAND VILLAGE
M17. SPRUCE GROVE
M18. MORINVILLE
M19. BON ACCORD
M20. GIBBONS
M21. LEGAL
M22. REDWATER
M23. TOFIELD
M24. CHIPMAN
M25. LAMONT
M26. BRUDERHEIM
M27. THORHILD
M28. RADWAY
M29. WASKATENAU

I 1. E. L. SMITH WATER TREATMENT PLANT
I 2. UNIVERSITY OF ALBERTA (THERMAL)
I 3. ROSSDALE POWER PLANT
I 4. ROSSDALE WATER TREATMENT PLANT
I 5. STELCO
I 6. C.I.L.
I 7. IMPERIAL OIL REFINERY
I 8. SYNCRUDE RESEARCH
I 9. TEXACO REFINERY
I10. GULF REFINERY
I11. CELANESE CANADA, UNIROYAL, FIBREGLAS
I12. CLOVER BAR POWER PLANT
I13. ALBERTA CONCRETE, NESBIT
I14. ALBERTA FOOD PRODUCTS
I15. MANVILLE CANADA INC.
I16. SHERRITT GORDON
I17. UNION CARBIDE
I18. DOW CHEMICAL
I19. ALBERTA CONCRETE, VILLENEUVE
I20. DIAMOND SHAMROCK
I21. SHELL REFINERY, SCOTFORD
I22. ESSO CHEMICALS, REDWATER

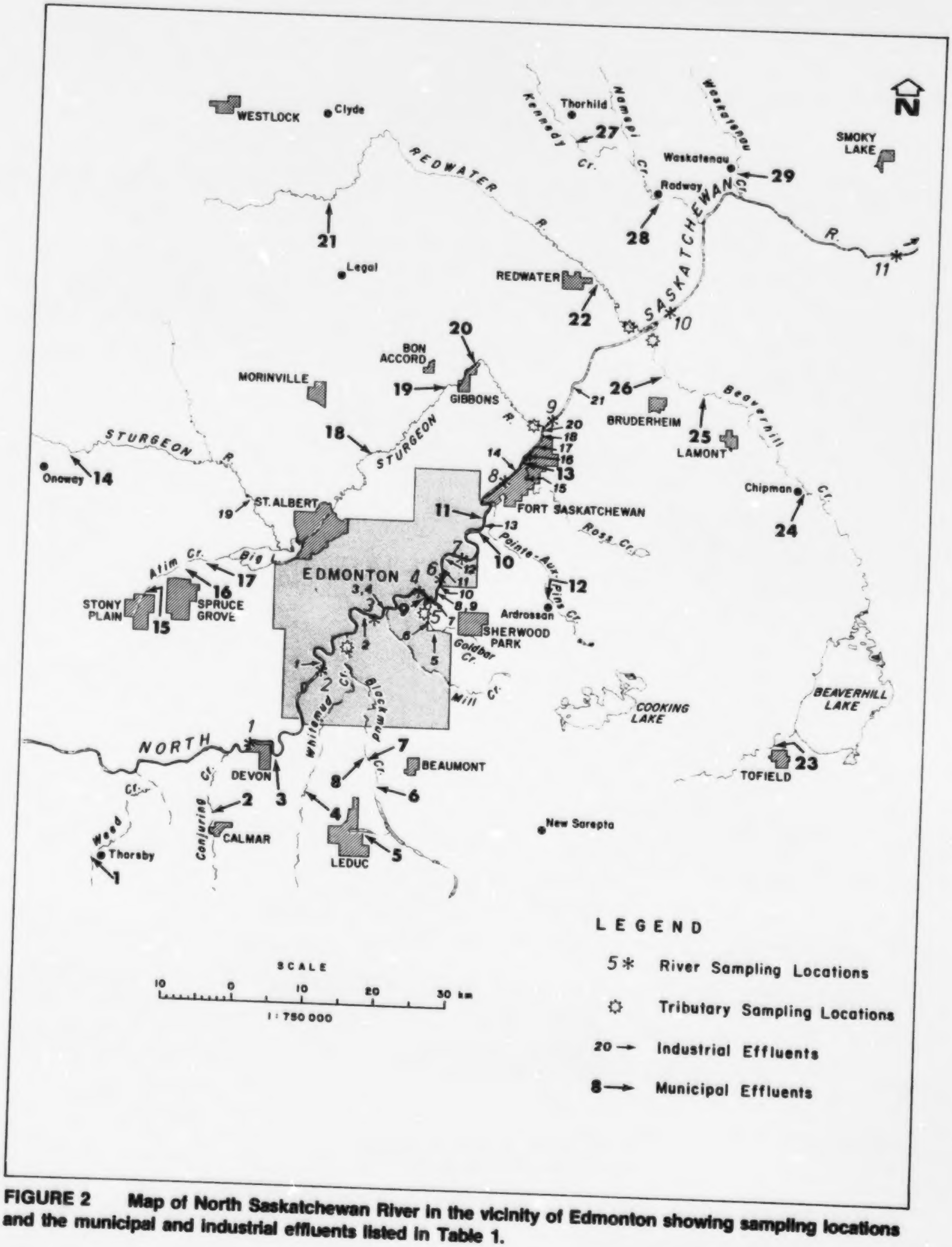

N
WESTLOCK
Clyde
Thorhild
Kennedy Cr.
Namepi Cr.
Waskatenau
Waskatenau Cr.
SMOKY LAKE
Radway
REDWATER R.
SASKATCHEWAN R.
Legal
REDWATER
BON ACCORD
MORINVILLE
GIBBONS
STURGEON R.
Onoway
ST. ALBERT
BRUDERHEIM
Beaverhill Cr.
LAMONT
Chipman
FORT SASKATCHEWAN
Ross Cr.
Pointe-Aux-Pins Cr.
Ardrossan
Big Lake
Atim Cr.
STONY PLAIN
SPRUCE GROVE
EDMONTON
SHERWOOD PARK
Goldbar Cr.
Mill Cr.
Whitemud Cr.
Blackmud Cr.
COOKING LAKE
BEAVERHILL LAKE
TOFIELD
NORTH
DEVON
BEAUMONT
Conjuring Cr.
CALMAR
Wood Cr.
Thorsby
LEDUC
New Sarepta
SCALE
10 0 10 20 30 km
1 : 750 000
LEGEND
5* River Sampling Locations
☼ Tributary Sampling Locations
20 → Industrial Effluents
8 → Municipal Effluents

FIGURE 2 Map of North Saskatchewan River in the vicinity of Edmonton showing sampling locations and the municipal and industrial effluents listed in Table 1.

Table 2.

CHEMICAL AND BIOLOGICAL CONSTITUENTS MEASURED IN THE 1982-1983 STUDY, NORTH SASKATCHEWAN RIVER.

FIELD MEASURED CHARACTERISTICS

Temperature
Depth
Flow
Dissolved Oxygen
Conductivity

MAJOR IRONS AND RELATED CONSTITUENTS

pH
Calcium
Magnesium
Hardness
Sodium
Potassium
Chloride
Fluoride
Carbonate
Bicarbonate
Alkalinity
Fluoride
TDS

OXYGEN DEMAND

Biochemical Oxygen Demand
Chemical Oxygen Demand

NUTRIENTS

Phosphorus (total)
Nitrogen (total part.)
Ammonia dissolved
Nitrite
Nitrate-Nitrite
Total Kjeldahl Nitrogen
Silica

METALS

Mercury
Cobalt
Copper
Nickel
Cadmium
Lead
Zinc
Beryllium
Aluminum
Arsenic
Selenium
Chromium
Manganese
Molydenum
Vanadium
Iron

CARBON

Dissolved Inorganic Carbon
Dissolved Organic Carbon
Total Particulate Carbon

RESIDUES

Total Residues
Filterable Residues
Non-filterable Residues

ORGANICS

* Polychlorinated Biphenyls
(PCBs)
Phenolic Compounds
Cyanide

* **Priority Pollutant Scan:**

Extractables - 79 compounds
Purgeable - 24 compounds
Chlorinated Pesticides
Chlorinated Herbicides
Organophosphorus Pesticides
Organonitrogen Pesticides

* SEDIMENTS

Priority Pollutant Scan
Extractables (79)
Chlorinated Pesticides
Chlorinated Herbicides
PCBs
Metals

BIOLOGICAL CONSTITUENTS

Total Coliform Bacteria
Fecal Coliform Bacteria
Fecal Streptococci
Standard Plate Count
(Heterotrophic Bacteria)
Chlorophyll **a**:
Benthic Algae
Free-floating Algae

---

* *one survey only, 5-6 October, 1983*

An extensive program to monitor the zoobenthos, or bottom-dwelling organisms, was undertaken in 1982 to complement the sampling of other constituents. These organisms act as useful indicators of long-term water quality, since many species live two or more years and they are relatively immobile on the river bed. Additionally, many species are very sensitive to pollution, and their presence is considered to be indicative of clean water. The algae that grow on rocks were also sampled for similar reasons.

The sediments on the river bed interact with the water, and may accumulate substances that are undetectable in the water itself. A preliminary survey of the sediments was completed in autumn, 1983. The main purpose of this survey was to provide an initial assessment of sediment chemistry, and to aid in the interpretation of data from the water component.

Potential Sources of Pollution to the River

There is a large and growing percentage of the land base in the Edmonton metropolitan area devoted to urban and industrial development. High concentrations of such development generate effluents from industrial plants, municipal sewage treatment plants, and storm and combined sewers. Industrial and sewage treatment plant effluents are concentrated as point sources. Most discharge continuously throughout the year. Operating under the Clean Water Act, the Standards and Approvals Division of Alberta Environment grants licences which specify discharge limits of these effluents. The Pollution Control Division monitors the discharge for compliance with the licence.

There are approximately 220 storm water and combined storm/sanitary sewer outfalls to the river within the boundaries of the city.

These discharge during periods of snow melt or during rain events. The City of Edmonton and Alberta Environment have conducted preliminary studies on the quality of these effluents. However, their impacts are not well defined, because of the large number of these storm water outfalls, and because their effect on the river is complex.

Potential sources of pollution in the North Saskatchewan River come not only from identifiable point sources, but also from diffuse runoff from lands used for agriculture and from changes to drainage patterns due to diversion and construction. Such non-point sources are difficult to assess, because they are associated with seasonal runoff and storm events, with little input during dry weather.

Other possible sources of contaminants within the city are the eighteen major snow dumps operated by the City of Edmonton during winter. The volume and composition of the meltwater from these dumps varies over time. The city is required by licence to monitor the composition of water from one of the snow dump sites each year.

River Flow and Water Use

Flow on the North Saskatchewan River is regulated by two hydroelectric power dams. The Brazeau Dam, on the main tributary, began operation in 1965; the Bighorn, on the mainstream, was completed in 1972. These dams lower the flood peaks and augment

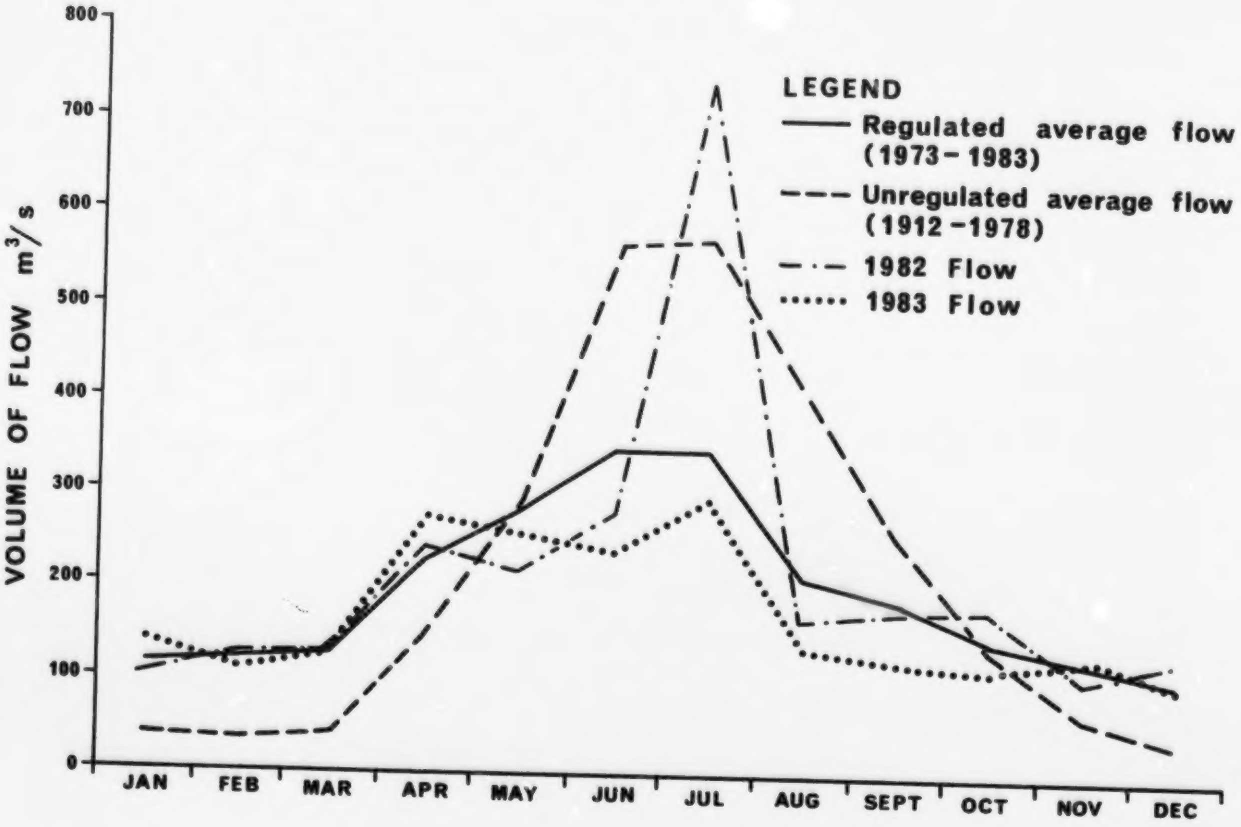


FIGURE 3 Flow (m^3 per second) in the North Saskatchewan River.

winter flows.[1] Based on data since 1973, the lowest average monthly flow in the river occurs in December and highest flow occurs in June and July during mountain snowmelt (see Figure 3). During the 1982 study year, flow in July was about twice the historical average for that month; flows during the other months were near or below normal. In 1983, flows were below normal throughout the summer and near average the other months.

Alberta is required by the Prairie Provinces Water Board to supply 50% of the unregulated flow in the North Saskatchewan River to Saskatchewan. The reservoirs are used to ensure that the specified flow is attained.

The largest consumer of North Saskatchewan River water in the study section is the City of Edmonton. This withdrawal is used for municipal supply and for power plant cooling. Most of this water is returned to the river unaltered. The annual net consumption of river water amounts to less than one percent of the annual average flow.

An important use of the river is the assimilation of waste loads. The licence requirements for effluent loads ensure there is sufficient capacity in the river to dilute or safely degrade these wastes. High river flows provide greater dilution, but the loading from non-point or diffuse sources and city storm sewers increases greatly during wet weather.

---

[1] *Crosby, J. 1982 **Prairie Provinces Water Board Water Demand Study: Environmental Considerations in the Saskatchewan-Nelson Basin - Alberta.** Planning Division, Alberta Environment.*

RESULTS OF THE STUDY

Temperature

North Saskatchewan River water temperatures in the study section ranged from 0°C in winter to about 25°C in summer. There was less than 1°C difference in water temperature between Devon and Pakan (the furthest upstream and furthest downstream locations in this study). Temperature differences can be somewhat greater where cooling water effluent from power plants enters the river. However, the increases in temperature at these locations were within the Alberta Surface Water Quality Objective of a 3°C rise. This temperature difference probably has a more positive than negative impact, causing open water in winter which enhances aeration.

Dissolved Oxygen

Adequate dissolved oxygen is essential for aquatic life. Oxygen increases in water as a result of turbulence and aeration, and via photosynthesis of plants. It decreases as plants and animals respire, and as organic material is decomposed by bacteria.

In the study section of the North Saskatchewan River, oxygen was near or above saturation[2] most of the year. There were seldom significant differences in site-to-site or bank-to-bank values. The lowest levels, ranging from about 65% to 85% saturation, were noted at two different times of the year - midwinter (February) and midsummer (July). A midwinter decline in oxygen is typical for most rivers, because ice cover prevents reaeration, and the reduced photosynthetic activity of plants cannot offset the effects of respiration. The summer decline is probably a result of plant and animal respiration during darkness, when no oxygen is produced by photosynthesis. At all times during this study, dissolved oxygen complied with the Alberta Surface Water Quality Objective of a minimum of 5 milligrams per litre. There were no apparent direct impacts due to the lower midwinter and summer dissolved oxygen levels.

Major Ions

Concentrations of major ions[3] were usually lowest during high-flow periods in the North Saskatchewan River (especially during spring and early summer runoff periods) and highest during low-flow periods (especially in August, but also in midwinter).

The dominant ions in the North Saskatchewan River are calcium and bicarbonate. The pattern of dominance of the eight major ions in the river is typical of many lakes and rivers in central Alberta. This pattern did not change between Devon and Pakan, although the concentration of most ions increased slightly in a downstream direction. Three ions, sodium, chloride and potassium, were significantly higher at Pakan. Municipal sewage discharges were the main source of the higher concentrations of sodium and chloride downstream, with tributary streams and industries contributing lesser amounts. For potassium, the largest contribution came from the tributary streams.

There are no Alberta Surface Water Quality Objectives for most major ions measured in this study. Concentrations of these ions are extremely variable in natural waters, and they are considered harmless even at much higher concentrations than occur naturally in most Alberta surface waters. No impacts are believed attributable to changes in major ion concentration throughout the study of the North Saskatchewan River.

Non-filterable Residues

Non-filterable residues, or suspended solids, are particles of soil or organic debris that would be removed if the water were filtered. Non-filterable residues were generally highest during high-flow periods as a result of erosion or wash-off from the land draining toward the river.

---

[2] *When water of a given temperature and pressure holds the maximum possible amount of oxygen or other gas, it is considered saturated with that gas.*

[3] *The eight major ions dissolved in surface waters are Sodium, Potassium, Magnesium, Calcium, Carbonate, Bicarbonate, Chloride and Sulfate.*

The Alberta Surface Water Quality Objective for non-filterable residue is based on a change from background conditions. Therefore, it is difficult to apply to a river in a developed basin because it is not known how much suspended material would have been in the river before it was developed. However, if we assume that conditions at Devon represent "background", 78% of the samples collected during the study complied with the objective. Most exceedences occurred during high runoff periods and seem to have city storm sewers as their principal source.

The main impacts of elevated levels of non-filterable residue would probably be on the plants and animals in the river. Sediment suspended in the water reduces light penetration and, as it settles out, fouls habitats of various organisms.

Metals

Metals occur naturally in surface waters, but also may derive from industrial effluents and automobile exhausts. Several metals are toxic at high concentrations, but toxicity varies among the forms in which they occur in the environment.

Sixteen metals were analyzed in water samples collected during the study. Of these, mercury, cadmium, selenium, molybdenum, cobalt and beryllium were undetectable in all samples. Four others, copper, chromium, vanadium and arsenic, occurred consistently at low levels during the study and showed little change between upstream and downstream sites. Iron and aluminum increased only when flow in the river was high, indicating an association with suspended solids and runoff.

Only four metals showed increased concentrations downstream of the city. The increase in manganese was very slight, and is derived from the sewage treatment plant at Gold Bar. Manganese occasionally exceeded the Alberta Surface Water Quality Objective; however, there is little concern with the levels measured in the study.

Nickel also increased slightly downstream of the city, especially on the right side of the river. The source of this increase is industrial inputs from the Fort Saskatchewan area. There is no Alberta Surface Water Quality Objective for nickel, because of its very low toxicity.

Lead showed a small but definite increase in the Edmonton area. The most likely source of increased lead in the river is the burning of leaded motor fuels, and subsequent wash-off from city streets during snowmelt and rainstorms. Lead values exceeded the Alberta Surface Water Quality Objective of 0.05 milligrams per litre in seven of 317 samples collected at several locations within the metropolitan area. No exceedances were detected upstream or downstream of the Edmonton-Fort Saskatchewan portion of the study section. The fate of lead entering the river in this area is not known. The possibility of accumulation in sediments or in aquatic organisms must be considered, although there is no evidence for this at the present time.

Zinc concentrations did not show a clear longitudinal pattern, although the highest values tended to occur at sites downstream of the city. The largest sources of zinc are the Gold Bar sewage treatment plant effluent and several industrial effluents in the Fort Saskatchewan area. Levels of zinc were below the

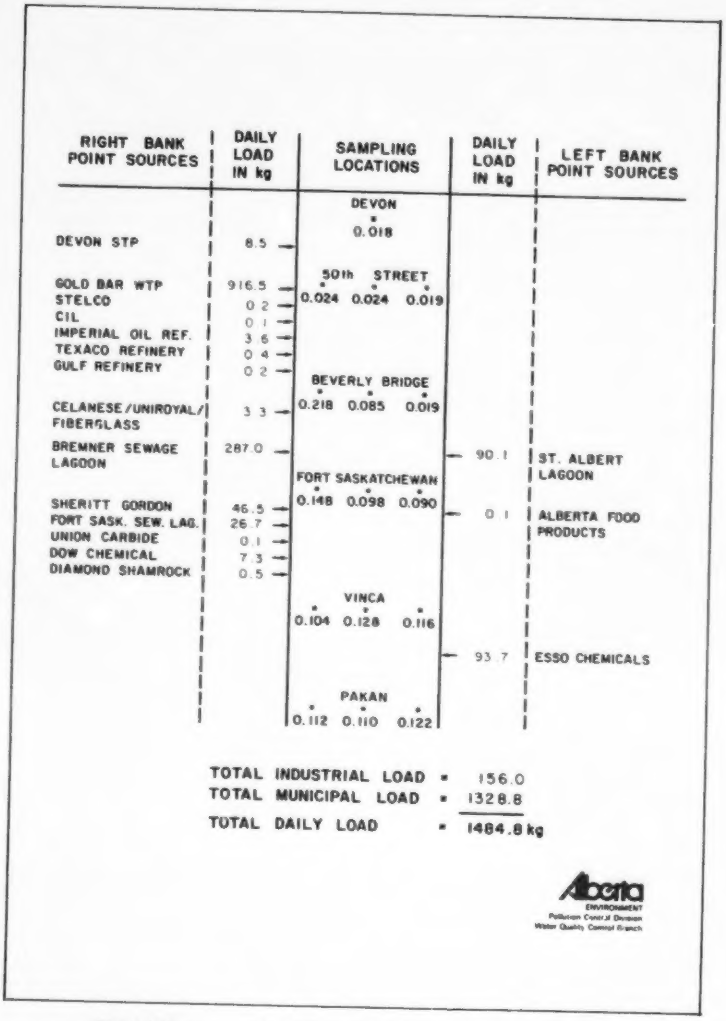

RIGHT BANK POINT SOURCES
DAILY LOAD IN kg
SAMPLING LOCATIONS
DAILY LOAD IN kg
LEFT BANK POINT SOURCES
DEVON
0.018
DEVON STP
8.5
50th STREET
0.024 0.024 0.019
GOLD BAR WTP
916.5
STELCO
0.2
CIL
0.1
IMPERIAL OIL REF.
3.6
TEXACO REFINERY
0.4
GULF REFINERY
0.2
BEVERLY BRIDGE
0.218 0.085 0.019
CELANESE/UNIROYAL/FIBERGLASS
3.3
BREMNER SEWAGE LAGOON
287.0
90.1
ST. ALBERT LAGOON
FORT SASKATCHEWAN
0.148 0.098 0.090
SHERITT GORDON
46.5
FORT SASK. SEW. LAG.
26.7
UNION CARBIDE
0.1
DOW CHEMICAL
7.3
DIAMOND SHAMROCK
0.5
0.1
ALBERTA FOOD PRODUCTS
VINCA
0.104 0.128 0.116
93.7
ESSO CHEMICALS
PAKAN
0.112 0.110 0.122
TOTAL INDUSTRIAL LOAD = 156.0
TOTAL MUNICIPAL LOAD = 1328.8
TOTAL DAILY LOAD = 1484.8 kg
Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

FIGURE 4 Diagram of phosphorus loadings (kilograms per day) to the North Saskatchewan River and median concentrations (milligrams per litre) of total phosphorus in the river 1983-1984.

Alberta Surface Water Quality objectives in 478 of 500 samples; the few exceedences showed little relationship to point sources, although they occurred at all sampling locations within the city and downstream.

Organic Compounds

Organic compounds are complex or simple molecules containing carbon. Natural organic chemicals are derived from soils, the breakdown of plants and animals, and weathering of bedrock. Such organic substances can be expected to occur naturally in the aquatic environment. In addition to natural inputs of organics, human activities within the river basin contribute small quantities of synthetic and natural organic compounds.

No detectable levels of chlorinated pesticides, chlorinated herbicides, organophosphorus or organonitrogen compounds, or PCBs were found in the North Saskatchewan River samples in the study. The occurrence of acid and base/neutral fractions and purgeable priority pollutants near or below the analytic detection limit suggests that these compounds are of very low risk to water users. These occurrences showed no apparent relationship to point sources. No surface water quality standards have yet been set for priority pollutant compounds.

The concentration of total phenolic compounds in North Saskatchewan River samples only rarely exceeded the Alberta objective level. Of the few high values, most were in unmixed sections of the North Saskatchewan River below point sources. Some phenolic compounds are of natural origin, but most are derived from municipal and industrial point sources in the Edmonton region. At the levels detected, it is likely that the greatest impact of phenolics would be one of imparting taste and odor to drinking water.

Nutrients

Substances that are required for the growth of plants and animals are called nutrients. In surface waters, phosphorus and nitrogen are often in low supply relative to the needs of aquatic plants, and plant growth is limited. If the nutrient supply should increase, as for example when sewage effluent enters a river, excessive plant growth may occur. Such excessive growth can in turn reduce dissolved oxygen levels at night in summer or during the winter.

Total phosphorus concentrations in the North Saskatchewan River were considerably higher downstream of the city than upstream. The largest sources were the Gold Bar and Bremner sewage treatment plants, which discharged to the right (south) side of the river. These large inputs are reflected in high phosphorus values in samples from the right bank sites from 50th Street Footbridge to Vinca Bridge. Concentrations in samples from the centre of the river increased gradually in a downstream direction, and samples from the left side were low as far downstream as Ft. Saskatchewan (Figure 4.) Concentrations at Pakan were similar in left, centre and right samples, but were somewhat lower than could be accounted for when all the inputs along the river are added. This deficit implies a loss or uptake of phosphorus, probably by the large aquatic plants or algae growing on the river bottom.

The Alberta Surface Water Quality Objective for total phosphorus was frequently exceeded during the sampling program. The objective was exceeded in over 90% of the samples from Pakan. Even at the two sites upstream of the city, the Alberta objective was exceeded in about 20% of the samples, perhaps indicating that the Alberta objective level is inappropriate for this particular river. The high values from upstream sites occurred during high flows when the river was silty; the phosphorus associated with these sediment particles is of a form that is less usable by plants than that derived from sewage.

The spatial pattern for total nitrogen was similar to that for total phosphorus: large inputs of nitrogen from the sewage treatment plants resulted in high concentrations on the right side of the river which gradually mixed in a downstream direction.

The Alberta Surface Water Quality Objective for nitrogren was exceeded mainly at right-bank sites near point-source discharges and at the furthest locations downstream. At Pakan, the objective was exceeded in approximately 24% of the samples collected in 1983. Under favorable environmental conditions, high concentrations of nitrogen and phosphorus may result in nuisance plant growth.

Chlorophyll a

The quantity of the photosynthetic pigment chlorophyll a in a water sample is a measure of the amount, or biomass, of algae in the water. The free-floating algae in a river orginate either from the bottom or from quiet areas or backwaters along the river's edge. The algae that grow attached to rocks were also measured during the study by extracting chlorophyll a from rock scrapings.

Chlorophyll a in samples for both free-floating and attached algae increased significantly in the North Saskatchewan River below major nutrient sources such as the Gold Bar Wastewater Treatment Plant. Differences between upstream and downstream chlorophyll a were accentuated during the summer low-flow period when light and temperature were optimal for growth. At this time, low nutrient levels probably limited growth upstream of the city.

No surface water quality guidelines have been set for chlorophyll **a**. The concentrations for free-floating and attached algae were generally low to moderate, and were therefore not a cause for concern. Under conditions of reduced scouring and clear water, however, a large biomass could develop which may result in reduced oxygen overnight in the river in midsummer.

Carbon

Carbon is a major constituent of the aquatic environment. Inorganic carbon, of which bicarbonate and carbon dioxide are examples, showed no seasonal or longitudinal patterns in samples from the study section of the North Saskatchewan River.

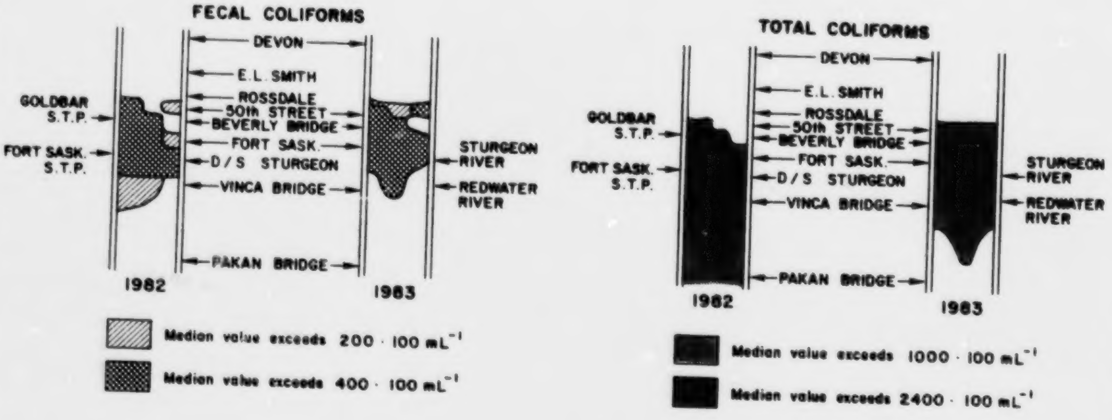
Organic carbon occurs within compounds dissolved in the water or in cells or other particles from living and dead organisms. The highest total organic carbon values tended to occur when river flows were highest. The organic carbon associated with particles was related mainly to surface runoff, much of which entered the river upstream of the study area. The dissolved fraction was clearly associated with municipal and industrial discharges and with tributary streams.

There is no Alberta Surface Water Quality Objective for organic carbon. The increase in organic carbon downstream of the city indicates enrichment which may lead to oxygen depletion as bacteria consume and break down organic compounds.

Bacteria

Bacteria are used to indicate the recreational safety of water. It is generally not possible to isolate disease-causing bacteria directly from recreational waters. Instead, an easily-measured group of bacteria known as coliforms are used as indicators of possible fecal contamination.

If large numbers of indicator bacteria are


FECAL COLIFORMS
DEVON
E.L. SMITH
ROSSDALE
50th STREET
BEVERLY BRIDGE
FORT SASK.
D/S STURGEON
VINCA BRIDGE
PAKAN BRIDGE
GOLDBAR S.T.P.
FORT SASK. S.T.P.
STURGEON RIVER
REDWATER RIVER
1982
1983
Median value exceeds 200 · 100 mL⁻¹
Median value exceeds 400 · 100 mL⁻¹
TOTAL COLIFORMS
DEVON
E.L. SMITH
ROSSDALE
50th STREET
BEVERLY BRIDGE
FORT SASK.
D/S STURGEON
VINCA BRIDGE
PAKAN BRIDGE
GOLDBAR S.T.P.
FORT SASK. S.T.P.
STURGEON RIVER
REDWATER RIVER
1982
1983
Median value exceeds 1000 · 100 mL⁻¹
Median value exceeds 2400 · 100 mL⁻¹

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

FIGURE 5 **Diagram of fecal and total coliform bacteria in the North Saskatchewan River study area.**

present, pathogenic bacteria may also be present. However, coliform bacteria occur in the intestinal tract of all warm-blooded species including humans, so relatively high numbers of fecal or total coliforms may occur even when the water is free of human pathogens.

Counts of total and fecal coliform bacteria were low in samples collected from locations upstream of the city. All samples met the Alberta Surface Water Quality Objective for direct contact recreation.

Within and below the city, however, bacterial counts were very high (see Figure 5). Counts in all samples collected immediately downstream of the Gold Bar Wastewater Treatment Plant effluent exceeded the Alberta objective level. Coliform counts tended to remain high or even increase as additional sewage effluents entered the river between Gold Bar and Fort Saskatchewan. Because of mixing in the river and natural die-off of bacteria, total numbers tended to decline by Pakan. This die-off occurred more rapidly in midsummer when the water temperature was high, so counts at Pakan were similar to those at Devon at that time. However, when the water was cool, counts at Pakan often exceeded the Alberta objective level for direct contact recreation.

The Alberta objectives for indicator bacteria are based on the assumption that health risks to swimmers or other people who contact the water directly are unacceptable when bacterial counts exceed the specified levels. Therefore, the results of the 1982-83 study suggest that swimming in the river may be safely done at Devon or other upstream areas, and at Pakan or further downstream during the warmest months. The presence of indicator bacteria in the river downstream of the city has no effect on drinking water supplies, because both water supply intakes are upstream of the zone of impact, and because drinking water is disinfected.

Biochemical Oxygen Demand

Surface waters contain various quantities of organic matter in both dissolved and particulate forms. The organic load carried by a river may be increased by the addition of municipal and industrial waste effluents. The organic matter is gradually broken down by bacteria, and this process consumes oxygen. The biochemical oxygen demand (BOD) of water may be measured in a laboratory. This test is used to assess the potential oxygen requirements of waste discharges entering receiving waters, although the actual oxygen demand might be quite different than that measured in a laboratory.

The BOD in the North Saskatchewan River approximately doubled between sampling locations upstream and downstream of the city. Samples from the left side of the river remained low through the city but gradually increased to maximum concentrations at Vinca and Pakan. BOD in samples from the right side of the river was high at Beverly Bridge, downstream of the Gold Bar Wastewater Treatment Plant. During dry weather the greatest load was derived from sewage effluent, but during a high flow, the tributary streams contributed the greatest load of BOD.

The Alberta Surface Water Quality Objectives state that BOD must not exceed a level which would create a dissolved oxygen content in the river of less than 5 milligrams per litre. Dissolved oxygen measured during the study was never less than 5 milligrams per litre, indicating little impact of BOD.

Other standards suggest that BOD values under 4 milligrams per litre are indicative of clean water. In this study, more than 95% of all BOD values were less than 4 milligrams per litre. The impact of organic loads on the river dissolved oxygen is generally low.

Zoobenthos

The animals that live on, under and among the rocks and sediments of the river bottom are referred to as the zoobenthos. Most of these animals are immature stages of insects, such as mayflies, stoneflies, caddisflies, and midges, but the zoobenthos also include worms, snails or other invertebrate types. The zoobenthos have inherent qualities that make them useful in assessing water quality in rivers. They have a relatively long life cycle, perhaps as long as two or three years in some species. Many of them are sensitive to pollution, so their presence or absence can be used as an indicator of the condition of the water. Their limited ability to move around means that they cannot rapidly migrate out of an impacted area.

Collecting zoobenthic organisms.

Zoobenthic organisms were collected in spring, summer and fall of 1982 at eleven locations from Devon to Pakan at both left-bank and right-bank sites. An analysis of this large data set led to the identification of three major zones of water quality along the study section (See Figure 6).

Zone I was an unimpacted section. It included sites that were upstream of major point source effluents, including the two sites upstream of the city and several sites within the city. depending on the season. In this zone, bottom-dwelling animals were virtually unimpacted; the species found there were indicative of river water of high quality. Mayflies, stoneflies and caddisflies, considered to be "clean water" types, were abundant.

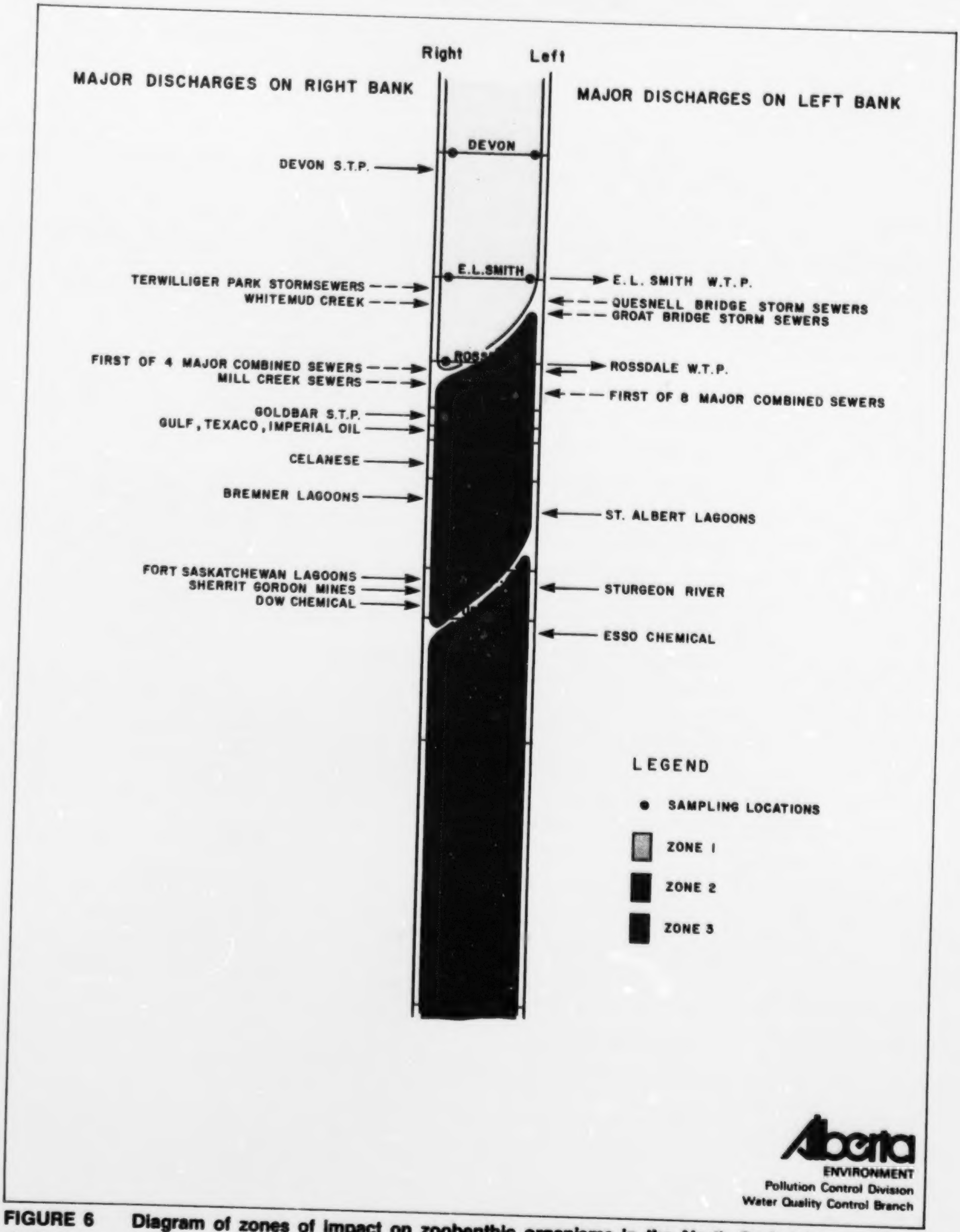
Zone II was impacted by point-source discharges within and below the city. Total numbers of organisms were higher than in Zone I. The numbers of pollution-tolerant organisms increased, so that the percentage of clean-water types decreased.

Zone III was a section downstream of Zone II showing some recovery. Total numbers of organisms were still much higher than in Zone I, but the percentage of clean-water species increased.

Municipal discharges, including storm and combined sewers, were largely responsible for the existence of zones of different water quality in the North Saskatchewan River between Devon and Pakan. Species tolerant of large organic loads responded to these point sources by increasing in numbers. It was also determined that this increase was greater below combined sanitary/storm sewers than below sewers discharging only storm water. The greatest impact was seen below the discharge from the Gold Bar Wastewater Treatment Plant.

Impacts of industrial discharges were masked by the enrichment effects of the Gold Bar discharge. There appeared to be no overall toxic effect within the study section, as demonstrated by the zoobenthos.

The length of the zone of impact depends on river flow and water temperature, as well as the quality and volume of effluent. The impact zone tends to be shorter in the fall than in the spring, because the water is warmer, and the breakdown of organic matter occurs rapidly. Additionally, the early summer peak flow scours the river bottom, cleaning it of organic debris.


Right
Left
MAJOR DISCHARGES ON RIGHT BANK
MAJOR DISCHARGES ON LEFT BANK
DEVON
DEVON S.T.P.
E.L.SMITH
TERWILLIGER PARK STORMSEWERS
WHITEMUD CREEK
E. L. SMITH W.T.P.
QUESNELL BRIDGE STORM SEWERS
GROAT BRIDGE STORM SEWERS
FIRST OF 4 MAJOR COMBINED SEWERS
MILL CREEK SEWERS
ROSSDALE W.T.P.
FIRST OF 8 MAJOR COMBINED SEWERS
GOLDBAR S.T.P.
GULF, TEXACO, IMPERIAL OIL
CELANESE
BREMNER LAGOONS
ST. ALBERT LAGOONS
FORT SASKATCHEWAN LAGOONS
SHERRIT GORDON MINES
DOW CHEMICAL
STURGEON RIVER
ESSO CHEMICAL
LEGEND
● SAMPLING LOCATIONS
ZONE 1
ZONE 2
ZONE 3

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch

FIGURE 6 Diagram of zones of impact on zoobenthic organisms in the North Saskatchewan River study area.

CONCLUSIONS

How has water quality in the North Saskatchewan River changed?

During the late 1960s and early 1970s, public attention was focused on environmental quality, and people became concerned about the condition of the North Saskatchewan River. A survey of public perception of water quality in the river was conducted in 1972.[1] Of 385 respondents from all over the City of Edmonton, 60% believed that the water leaving the city was very polluted.

Public perception has not changed since then. If anything, media attention has probably increased the number of people who believe the river to be polluted.

However, water quality in the North Saskatchewan River has improved considerably over the past thirty or more years. For example, during the winter in the 1950s, oxygen was often at levels below the present Alberta Surface Water Quality Objective of 5 milligrams per litre. At times it was zero at the Saskatchewan border. The water appeared "dirty" with bits of garbage and visible grease, and it had sewage-like odors.[2] Since then, all municipal and industrial wastewaters are treated, and winter flow from the reservoirs is higher. Water quality in the river has improved to the extent that winter oxygen is maintained at the Alberta objective level as far downstream as the border with Saskatchewan.

How does water quality vary over time and distance?

Water quality in the North Saskatchewan River varies naturally over the seasons, especially in response to changing flow. High flows in the spring and early summer are a result of local mountain runoff. At this time, soil particles and organic debris are carried into the river, and it appears muddy or silty with suspended solids. Substances that are naturally associated with suspended solids, such as phosphorus, iron, aluminum, manganese and certain organic compounds, also increase.

When flow in the river declines in late summer, concentrations of these particulate substances decrease while concentrations of certain dissolved substances such as major ions increase. It is at this time, too, that algae and other aquatic plants growing on the river bottom have produced their maximum growth, in response to high temperature and high levels of light.

As winter approaches, aquatic plants die and decay, releasing stored nutrients and organic compounds. Ice cover inhibits aeration, and oxygen levels may decline somewhat. Concentrations of ammonia nitrogen and dissolved phosphorus may increase.

Superimposed on these natural occurrences in the river is the effect of municipal, industrial and stormwater discharges from the metropolitan area. These effects were determined during the study by comparing water quality upstream and downstream of the city. Substances that were higher immediately downstream included dissolved organic carbon, nitrogen, phosphorus, sodium, potassium, chloride, sulfate, nickel, manganese, lead and zinc. Additionally, biochemical oxygen demand, chlorophyll a (algae), zoobenthos, and bacteria were higher downstream than upstream in response to inputs of organic matter. In many cases, levels of these chemical and biological components declined gradually in a downstream direction. Differences from one side of the river to the other were also apparent within the city and downstream to Pakan where the river was mixed.

---

[1] *Watson, D.J. 1972. Perception and management of water quality in the North Saskatchewan River at Edmonton, Alberta. M.Sc. Thesis, Dept. of Geography, Univ. of Alberta.*

[2] *Bouthillier, P.H. 1984. A history of stream pollution assessment and control — the North Saskatchewan River 1950s to 1980s. Report to Water Quality Control Branch, Alberta Environment*

How does present water quality compare to the Alberta Surface Water Quality Objectives?

There are no Alberta objectives for many of the chemical substances measured during the study, such as the major ions, many trace organic compounds, and total organic carbon. These are considered harmless at the levels measured. There are also no objectives set for chlorophyll a and zoobenthos.

Many water quality components, namely temperature, dissolved oxygen, biochemical oxygen demand, most metals and certain organic compounds, either complied with the objectives or were undetectable in the water.

Some substances, such as phenolic compounds, ammonia-nitrogen, lead and zinc occasionally exceeded the objectives. A few constituents regularly or frequently exceeded the objectives: natural levels of iron and manganese; about 90% of samples for total phosphorus and 30% of samples for total nitrogen exceeded the objectives at Pakan; 21% to 35% of all bacterial samples exceeded the objectives at Pakan. The percentage of samples exceeding the objectives were usually higher near sewage treatment plant outfalls.

How do urban development and other impacts affect water quality?

Municipal sewage treatment plant effluents had the greatest impact on the study section of the North Saskatchewan River. These effluents are rich in phosphorus, nitrogen, organic material and indicator bacteria. As a result, the biomass of free-floating and attached algae increased between sites upstream and downstream of the city. The biomass of pollution-tolerant zoobenthos was also higher downstream. Indicator bacteria were abundant in samples as far downstream as Pakan, except in August.

How are uses of the river affected by the impact of urban development?

The major uses of the North Saskatchewan River in the study section are for municipal water supply, for cooling in power plants, and for the assimilation of waste loads. Minor uses are for swimming, boating, fishing, stock-watering and the irrigation of crops. As with many multiple-use resources, there are conflicts among these uses of the river.

For example, high numbers of coliform bacteria downstream of the Edmonton urban area limit the use of river water for swimming, livestock watering and irrigation of vegetable crops. Although the river's use as a municipal water supply also would be limited by bacteria immediately downstream, there are no such withdrawals at the present time. Although a very large set of data was collected during the study, many concerns, such as the impact from the urban area on fish, could not be thoroughly addressed, nor could the effects of possible interactions among the various substances in the water. These issues are extremely complex, and require further study.